Diet, exercise and CHD risk : a comparison of children in the UK and Pakistan.

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Diet, Exercise And CHD Risk: A Comparison Of Children In UK And In Pakistan

A THESIS SUBMITTED BY

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ABSTRACT

The purpose of this study was twofold; to observe the differences in dietary and other characteristics relevant for coronary heart disease in 10-12 year old Caucasian, Pakistani and Indian schoolchildren in UK and urban and rural Pakistani schoolchildren in Pakistan; and to study the relationships between observed dietary and other characteristics relevant for coronary heart disease.

A total of 748 children, 350 girls and 398 boys participated in this study. The UK sample consisted of 257 (39 Caucasian, 82 Indian and 136 Pakistani) children from Slough and the sample from Pakistan had a total of 491 (181 affluent urban, 172 less affluent urban and 138 rural Pakistani) children from the province of Punjab.

The characteristics which were studied included behavioural (dietary and physical activity habits, cardiovascular nutrition knowledge, smoking intentions, body weight and health, self concept of fitness and weight), personal physical (body mass index and waist-hip ratio) biochemical (fasting blood glucose and total blood cholesterol) and familial (family disease history of diabetes and heart diseases) characteristics of the subjects.

Information about children's food and activity habits and other behavioural characteristics was obtained through a questionnaire and three day food and activity records and about familial characteristics through a parents' questionnaire. Anthropometric measurements (height, weight, waist and hip circumference) were made using portable stadiometer, electronic scales and measuring tape; to assess the body mass index and waist-hip ratio. blood tests were carried out using Boehringer Mannheim Accutrend GC blood testing system to measure fasting blood glucose and total blood cholesterol.

The three groups of children studied in UK were not significantly different from each other in terms of body mass index, waist-hip ratio or total blood cholesterol but the Pakistani children had higher fasting blood glucose than the other two groups. British Caucasian children ate more meat, potatoes, cakes and less vegetables and wholemeal bread than Pakistani and Indian children In terms of nutrient intake, Caucasian children had a significantly higher percentage of energy from fat and lower percentage from carbohydrate

and protein and lower mean P:S ratio as compared to Pakistani and Indian children. A higher proportion of Caucasian children had a positive family history for heart disease but not for diabetes. But among those who had a positive family history more of the Indian and Pakistani children had fathers with CHD or diabetes than the Caucasian children. Differences in activity habits and cardiovascular knowledge score were not significant in the UK group. More British Pakistani and Caucasian children had a smoker in the family compared to British Indian children, but a higher proportion of Caucasian children expressed their likelihood of smoking in future.

In general differences between the three groups of children studied in Pakistan were more marked than between the three groups in UK. Both the urban groups had higher fasting blood glucose, cholesterol, body mass index, waist-hip ratio, higher percentage of energy from fat, lower physical activity level, higher frequency of positive family history for diabetes and heart disease; and higher cardiovascular knowledge score and lower percentage of smoking family members.

British Pakistani children had significantly higher mean blood glucose and cholesterol, lower physical activity level and higher cardiovascular nutrition knowledge score, than any of the three groups of children in Pakistan.

Although the differences between British South Asian and British Caucasian children were not always statistically significant the nature of differences was the same as seen in relevant adult populations. British South Asian children showed a tendency to have lower BMI but higher WHR than Caucasian children. Total blood cholesterol was higher among the Caucasians while fasting blood glucose was higher in the South Asian children.

In general differences between the rural and urban Pakistani children were similar to the differences observed between rural Pakistani and British Pakistani children. Rural Pakistani children appeared to be at a lower CHD risk as compared to urban Pakistani or British Pakistani children.

DEDICATED TO

MY PARENTS

MR MOHAMMAD ASAR HUSSAIN

AND

MRS QAMAR JEHAN BEGUM

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Divisional Public Girls School, Lahore Pakistan

Divisional Public Boys School, Lahore Pakistan

Central Model Boys School, Lahore Pakistan

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1. INTRODUCTION

1.1 Lifestyle And Health

" *geography is nothing but history into space and similarly history is geography on a time scale*" Reclus (1905)

Changes in lifestyle are related to modifications in diet and activity and variations in health. However due to the many factors encompassed in the term 'lifestyle' and the numerous biological aspects in which a human being may vary, it is difficult to make definite conclusions about the relationship between lifestyle and health which would be universally applicable.

1.1.1 Patterns Of Changes In Lifestyle, Diet And Health

The lifestyle and diets of human beings always seem to have been changing, even though at differing rates, in different places at differing times. These changes and the associated nutrition transitions have been described by Popkin (1994) in terms of five broad patterns which are not restricted to a particular period of human history but continue to characterise certain geographic and socio-economic sub-populations.

In the first pattern - where food is acquired through hunting and gathering, the diet of people tends to be high in carbohydrates and fibre, low in fat and high in biologically available iron (Harris 1981, Truswell 1977). This is often associated with relatively short life expectancies possibly due to high rates of infection (Eaton et al 1988). In the second pattern characterised by the development of agriculture and accompanied by famine and food shortage, the diet is less varied and these changes are thought to be associated with nutritional stress and reduction in stature (Eaton & Konner 1985, Vargas et al 1990). This pattern is commonly accompanied by social stratification and increased variations in health due to gender and social status (Brown & Konner 1987, Newman et al 1990). In the third pattern of receding famine, consumption of fruit and vegetables and animal protein increase and starches became less important dietary staples (Popkin et al 1994). The fourth pattern is characterised by a diet high in total fat, cholesterol, sugar and other refined carbohydrates and low in polyunsaturated fatty acids and fibre accompanied by a sedentary lifestyle which is now characteristic of many high income societies and some segments of the population in lower income societies. This results in an increased prevalence of obesity and contributes to an increase in degenerative disease (Omran 1971).

A fifth pattern of behavioural change appears to be emerging as a result of changes in diet associated with the desire to prevent degenerative diseases and promote health. These changes have been instituted in some countries by consumers and in other countries by a combination of government policy and consumer behaviour. It remains to be seen if these changes will result in a large scale transition in diet structure and body composition (Milio 1990, Popkin 1989, Popkin 1992).

Some patterns which have given way to others in one population centuries ago may still be found in others and may even exist side by side in particular countries. In high income countries this transition has been gradual and in many countries like USA (Popkin 1989), Canada, France, Germany and Great Britain, (Byers et al 1994, Hielmert et al 1990, Hulshof et al 1991) the fifth pattern of behavioural change in response to degenerative disease has started. Norway and Finland have attempted to change eating patterns through policies at a national level (Milio 1991, Oshaug 1991).

In other countries transition has occurred over a relatively short period of time. For example, industrialisation, urbanisation and changes in diet took place at an accelerated rate in Korea and Japan. In Japan, between the end of world war II and 1987, daily per capita consumption of animal products increased by 256 gm, daily per capita total fat consumption increased 341% and the proportion of energy from fat increased from 8.75% to 24.8% (Yamaguchi 1991). Other countries in Asia (China, Indonesia, Malaysia and Thailand) are now experiencing a similar economic and demographic transformation, which is reflected in a changing food consumption pattern (Popkin 1994). In each case change in energy intake has been small, but there have been large changes in consumption of animal products, sugar and fats (Popkin 1994) Information about physical activity and obesity is not available from all of these countries but where it is available physical activity is found to be decreasing and obesity to be increasing (Popkin 1994).

In many of these South East Asian countries problems of under- and overnutrition appear to coexist. For instance in China there has been an increase in the proportion of overweight in all groups except for low income women. Changes in physical activity and diet were significantly associated with changes in Body Mass Index, thus polarisation of nutritional problems is emerging in China. Increasingly it appears that earlier equal distribution of nutritional problems is being replaced by problems of excess and deficit among the rich and poor respectively (Popkin 1994). These differences are also showing their effect in terms of malnutrition among the underprivileged and chronic diseases among the rich (Ge, 1995).

There is currently no large population based study of diet and obesity encompassing all economic groups in South or South East Asia, so it is difficult to understand these trends (Gopalan 1992). Large community based surveys in India indicate that people from higher socio-economic status backgrounds have a prevalence of coronary heart disease (CHD) three to four times higher than the rate for the lower socio-economic status (SES) group (Gopalan 1992, Chadha et al 1990, Padmavati 1962). In these surveys, higher income persons consumed a diet averaging greater than 32% of energy from fat while lower income persons consumed a diet with 17% of energy from fat (Padmavati 1962). There is a trend toward increasing prevalence of diabetes mellitus and Gopalan (1992) suggests that despite the lack of definitive survey results obesity is increasing in India.

The problems of dietary excess have begun to dominate the higher income Central and South American countries and most of the Caribbean. In Brazil a marked decline in percentage of malnourished children and increasing obesity have been noted (Lunes & Monteiro 1993, Sichieri et al 1994). In contrast to China the situation in many areas of Brazil approximates to that of the United States where the poor suffer more from the problems of dietary excess than do the rich, with non-communicable disease and mortality from cardiovascular and other diseases greater among the poor (World Bank 1990).

In the Caribbean, adult obesity and high rates of morbidity and mortality from chronic degenerative diseases have begun to predominate. The structure of the diet has shifted in a manner comparable to the high income western country model (Sinah & McIntosh 1992).

In urban Africa a number of food consumption surveys have shown large increases in consumption of refined foods and fats (Trowell 1981). Cote d' Ivoire, Mozambique, Algeria and Libya have begun to show increases of fat in the overall food supply. This change is most rapid in the higher income Libya, where at the aggregate level, more than 30% of the energy is derived from fat, with about 10% from animal fat. In African countries the rapidity of diet- related health changes in sub-populations independent of socio-economic change is striking. For example in 1930 there was virtually no incidence of diabetes in Kenya (two patients per year). By the late 1970's diabetes has became common, despite the absence of socio-economic change that has accompanied such increases in the higher income countries. (Trowell 1981).

In South Africa transition to the western diet has occurred in both rural and urban areas (Bourne et al 1993a, 1993b, 1994). More marked was the shift in the structure of diet associated with proportion of time each person had spent living in an urban environment. (Bourne 1993b) It is interesting to note than in some countries growth retardation and wasting coexisting with obesity among pre-schoolers has also been observed (Steyn et al 1991).

1.1.2 Demographic transition and health

From a historical point of view, urban areas of the world, showed a transition from a high prevalence and high death rate from infectious diseases to longevity and higher incidence of chronic diseases. During Medieval times cities were not very large and the size was determined by disease and rural in-migration. Mortality rates are estimated to have been very high due to epidemics like cholera, smallpox, plague; and constancy of population size depended on immigration. (McNeil 1976, Storey 1985).

By about 1750 the rate of urban mortality (in today's developed countries) due to epidemic disease was sharply reduced due to the dual effects of the biological adaptation of the human host and pathogens towards each other, as well as improved sanitation, water treatment and other public health measures (Mascie-Taylor & Lasker 1988).

Today adaptation to the diseases of urbanisation including genetic and physical changes, public health programs, child labour and education laws and medical treatment result in generally better health in the urban versus rural areas of the developed and developing world. Rural poverty, malnutrition and high rates of infectious disease interact synergistically and result in higher rates of morbidity and mortality than in the city (Mascie-Taylor & Lasker 1988).

However urban lifestyle is associated with an increase in chronic diseases. Diabetes, heart disease, hypertension and obesity are a few of the diseases which are found to be very closely related to lifestyle factors prevalent in urban areas of the world e.g. lack of physical activity, stress, higher intake of salt, sugar, fat and energy (Mascie-Taylor & Lasker 1988).

Non communicable diseases (NCDs) are either newly appearing, rapidly rising, or already established at high levels in every country of the world today, depending on its stage of epidemiological transition. Some of the most dramatic recent changes in NCD rates have however occurred in developing nations. Between 1970 and 1980, the prevalence of chronic diseases increased by 50-100% in many regions of Africa, Asia, Latin and South America. The global rise in NCDs has been associated with marked changes in lifestyle characteristics of populations, such as diet and other potentially modifiable behaviours (smoking, body weight, exercise etc.) (Posner et al 1994).

In an international collaboration involving fifteen countries (Australia, Chile, China, Cuba, Cyprus, Finland, Japan, Lithuania, Malta, Mauritius, Russia, Sri Lanka, Tanzania, Thailand and the USA) the changes in dietary patterns (between 1954 and 1986) indicated global nutrition trends which are unfavourable with respect to NCD morbidity and mortality (Posner et al 1994).

Global increase in urbanisation accompanied by increase in NCDs is a cause of concern for most nations but probably more so for less developed countries. The less developed nations are at present less urbanised than the developed nations but their rate of urban growth is greater (Posner et al 1994). Rural-urban difference in the diets of these countries may indicate the kind of changes to be anticipated in disease with increase in urbanisation. Facts available about Pakistan are presented as an illustration.

- ***Diet and health variations in Pakistan.***

Pakistan has an agricultural economy. It has a total population of 84.3 million inhabitants (GoP 1993) out of which more than 70 % reside in the rural areas. The rural areas are characterised by a lower literacy rate (17.3 %) than the urban areas (47%) and poorer availability and access to health, educational and housing facilities. Sixty three percent of the rural working force are involved in agricultural work, nearly 20% work as labourers and the rest have clerical or sales jobs. In urban areas 41% work as a labourer or factory worker, 23% as sales worker, 8%, 9% and 8% respectively as professional, clerical and service workers and only 7% work in the field of agriculture, animal husbandry or forestry.

The diets of the rural and urban population have certain distinct characteristics. According to the National Nutrition Survey of 1985-87, the mean intake of cereals, vegetables and milk was higher in rural areas and that of meat, egg and fish higher in urban areas of the country. Annual household expenditure survey reports also indicate that the rural population of Pakistan has a higher level of consumption of wheat, rice, gram, milk, butter, ghee, brown sugar and 'gur' and lower per capita consumption of meat, eggs, white sugar and vegetable oil (GoP 1986, 1987, 1988a, 1993a). So while the National Nutrition Survey shows that sugar consumption is higher in rural areas it becomes clear from household expenditure survey reports that the main type of sugar consumed in rural areas is not white refined sugar but unrefined brown sugar or 'gur' (jaggery).

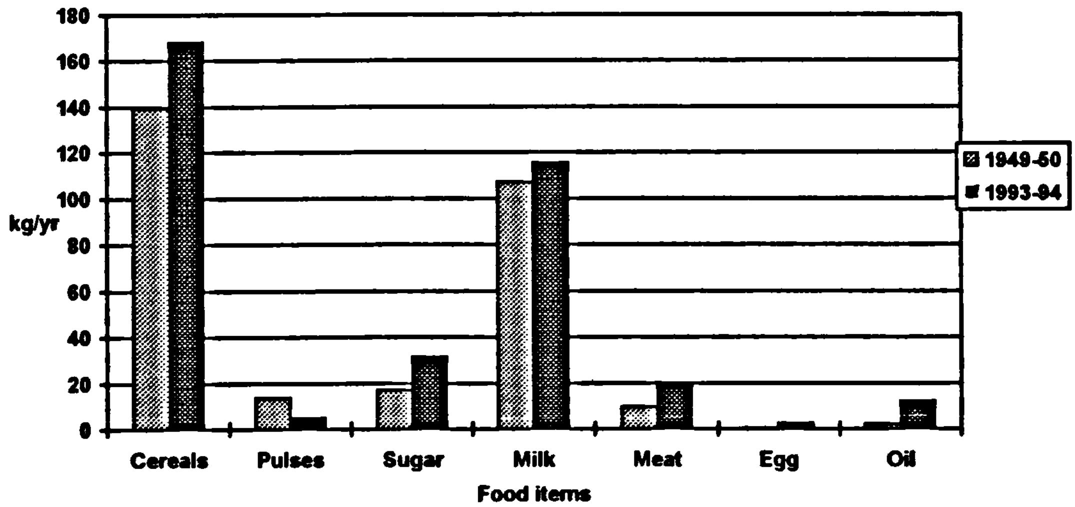
Over the years food availability in general has increased (fig 1) but that of pulses has decreased. Availability of edible oils has increased six- fold, from 2.3 kg/year per person in 1949 to 12.19 kg/person/year in 1993 (GoP 1996).

Table 1-1: Amounts Of Foods Eaten (grams/day) In Rural And Urban Areas Of Pakistan

	Rural	Urban	City*
Total Cereals	570	534	404
Wheat	488	466	370
Rice	82	68	34
Pulses	42	42	44
Oil	29	36	36
Egg	5	7	9
Fish	8	11	2
Meat	26	42	53
Roots	49	40	30
Leafy Vegetable	14	16	3
Vegetable	60	77	83
Fruit	4	7	13
Milk	257	114	75
Tea	148	140	158
Sugar	48	32	31

National Nutrition survey 1985-87 *Includes Karachi and Lahore

Figure 1-1: Per Capita (kg/yr) Food Availability In Pakistan- In 1949/50 And In 1993/94



Economic Survey 1996, Government of Pakistan Bureau of Films and Publications

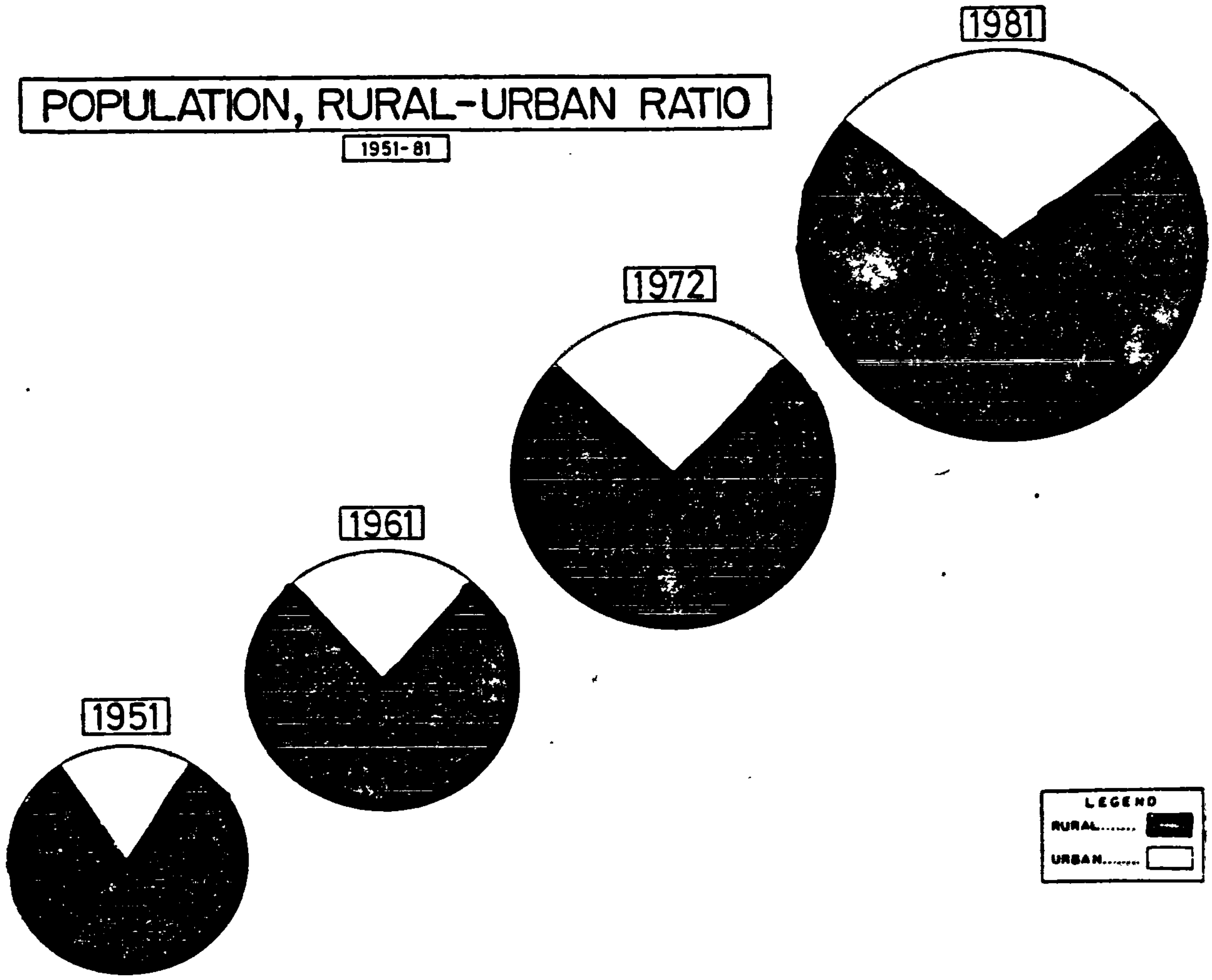
Urbanisation is increasing in Pakistan (Khan, 1983, GoP, 1995). While the overall population is increasing at the rate of 3% the growth of urban population is 4%. (see figure 1-2). Internal rural to urban migration was 25 % of total internal migration in 1972 and 38% in 1978 (Irfan et al 1979). Urban growth rate is increasing as an indirect effect of external migration also. People originating from rural areas who migrated to the Middle East often return to urban areas of Pakistan (Irfan et al 1979).

In view of increasing urbanisation it may be anticipated that urbanisation related problems seen in other countries would also be increasing in urban areas of Pakistan. Hospital records indicate that incidence of CHD is increasing in urban areas of Pakistan (GoP 1991). According to data published by the Statistical Division of Pakistan in the Fifth Five Year Plan, the main cause of death in both rural and urban areas of Pakistan was infective and parasitic diseases (67 and 63 % respectively), but death rates from heart disease was higher in the urban areas (GoP, 1978, 1983,).

Although there have been no nation-wide studies addressing this problem, studies carried out on a smaller scale by health professionals have supported this view. Studies which looked at ischeamic heart disease prevalence and relevant risk factors in Pakistan indicated that the disease prevalence is higher in urban areas and many of the risk factors associated with CHD were found to be similar to those found in other countries (Syed 1967, Beg et al 1967, 1970, Jabeen et al 1985). Risk factors like family history of IHD, history of smoking, diabetes, hypertension, elevated serum cholesterol and uric acid were found more frequently in cases than in controls in a comparative study of 55 male patients who had had first attack of myocardial infarction (MI) and their age matched controls (Usman et al 1979).

In a relatively large study of 512 cases suffering from first MI and 755 matched controls, a positive family history of CHD, hypertension, diabetes, stroke or combination of these was given by 25% of cases and 16.6 % of controls and this difference was statistically significant. A significantly higher percentage of controls had never smoked and significantly higher proportion of cases had smoked for over ten years as compared to controls (PMRC 1978).

Figure 1-2: Urbanisation in Pakistan



Population Atlas of Pakistan. Government of Pakistan 1993 FBS Karachi.

More recently in a comparative study of 42 IHD patients and 45 age and sex matched controls, patients with IHD had a higher incidence of positive family history for IHD, higher incidence of hypertension, hyperlipidaemia, NIDDM and history of smoking (Akhtar et al 1993).

Although these studies show that the risk factors found to be associated with CHD in other countries are found to be present at a higher rate in CHD patients in Pakistan as compared to controls, a study carried out on an apparently healthy population indicated that the percentage energy from fat was much lower in the diets of Pakistanis (26%) as compared to that in western countries (Ibrahim and Zuberi 1981). However in the males, consumption of saturated fats was found to be high and blood cholesterol levels were significantly and positively correlated to fat intakes. Another study compared CHD risk factors in 138 IHD patients from Multan (a relatively small city) to CHD risk factors reported in another similar study in Karachi (a comparatively more modern city) and to a comparable study in Boston. The authors concluded that while the predisposing factors for CHD seen in Pakistan were similar to those seen in Americans such as blood pressure, smoking and family history, the blood cholesterol levels were lower in Pakistani patients (Ahmed et al 1977).

According to a comparative study carried out in 4232 adults belonging to affluent and poor urban populations of Karachi, the affluent populations had a higher prevalence of obesity, diabetes and IHD. Although this study had certain limitations; (for instance, the authors have indicated that a proportion of the difference in affluent and poor populations might be due to greater awareness and access to health facilities by affluent ones,) the findings do point towards a potential risk. The rates of diabetes in the affluent sub-group were found to be comparable to that found in South Asians living in UK (Hameed et al 1995).

1.1.3 Geographical transition (Migration)

Individuals or groups move from one set of dietary and other lifestyle habits to another not only through the chronological dimension of time but also through the geographical dimension of space. Migration of people from one type of environment to another represents this situation. Migration involves changes in lifestyle and patterns of health and disease. When people migrate from less developed to more developed countries the changes in diet and health are similar to those found to be associated with urbanisation. But in such cases the nature of the transition is more unpredictable and is likely to be abrupt. However migrating populations are found to go through a transitionary process which is shown in many studies of food habits and migration. It is debatable whether immigrant groups ever adopt completely the eating habits of the host culture. The rate and extent of assimilation is variable and is found to be different among different cultural and religious groups: but what is certain is that all migrants experience dietary and lifestyle changes and changes in health.

- ***Migration and diet***

Reliable information about changes in food consumption patterns of migrants may give clues to understanding variations in the disease pattern among those migrants. Even if the pattern of food intake is similar, the impact of food intake and subsequent pattern of the relevant disease may be different in two groups of the population. Firstly due to previous biological adaptations migrants may respond differently to a new food. Secondly the foods to which they were accustomed may affect them differently in a new environment due to variations in season, meal times, activity patterns. Thirdly, apparently similar food might be actually somewhat different from the food the immigrants were accustomed to. Exploration of such relationships may help in understanding the aetiology of disease amongst immigrant groups.

Understanding the type of changes that take place in the diets of migrants is a pre requisite to understanding the relationship between dietary changes and health. Kocturk (1996) suggests that an understanding of the structure of food habits may help in understanding change in eating habits. "An exploration of the conceptual functions that different food components perform in the composition of a meal gives clues as to the degree of importance placed on each item as a signifier of the type of food culture with which an individual or group identifies itself". A model consisting of three concentric circles is presented by Kocturk in which food items are assembled in three major groups assigning them different degrees of importance according to the role they play in the construction of a dish and/or meal (irrespective of their nutritive value). In this model staples are assigned a central role, with peripheral and marginal foods playing secondary and tertiary roles, respectively.

Adaptation to new food habits proceeds from the outer shell towards the core- a diet begins to change with the incorporation of new types of accessory foods to different complements and finally to the incorporation of new staple foods. The closer the change proceeds towards the centre, the slower the rate of change (Kocturk 1996).

Migrants try to adhere to the core traditional foods as far as possible. In a study of changes in the food consumption pattern of 60 Southeast Asian refugee families (Cambodian and Hmong) living in the United States, no significant changes in consumption pattern were found for rice, oil, vegetable or tea (Storey & Harris 1989). In a study of food consumption of European and Indian (South Asian) factory workers nearly all of the Indian subjects consumed their traditional dishes, curry and chapati, regularly (Smith et al, 1993). Ho et al (1968) found that among Chinese students core foods representing dietary staples like rice changed little regardless of duration of residence. The greatest changes appeared to be found among peripheral and marginal foods (Krondl, et al 1984).

Although the basic pattern of food consumption is maintained, changes are inevitable in quantity and quality of ingredients and use of convenience foods. Not all meals may be changed equally. Breakfast is changed to a greater degree due to limitations of time. Tan and Wheeler(1982) and Yang and Fox (1974) found among Chinese immigrants to UK and USA respectively that the traditional pattern changed at breakfast. Convenience foods which required little or no preparation like cereals, bread and biscuits replaced traditional congee. For working or studying family members eating their midday meal away from the family, this meal may also be different from traditional foods. Exposure to the school environment can influence children's food preferences especially if they eat in school lunches and receive nutrition education at school (Bavly, 1966).

As far as peripheral foods are concerned, people migrating towards western countries usually have increased consumption of soft drinks, canned foods, candy, baked products and alcohol. Southeast Asian refugee families in the United States had higher consumption of soft drinks, butter, margarine and breakfast cereals (Storey & Harris 1989). Sudanese students in the UK, despite their religion, showed a slight increase in the consumption of alcoholic beverages (Al-Mokhalalati 1982). However some foods, although not frequently eaten, retain their cultural importance. Grivetti & Paquette (1978) found that despite reduced availability and increased cost, some Chinese immigrants in California still bought foods like snails and snakes.

With movement towards western countries, energy intake is higher along with fat, sugar and salt consumption (Mascie-Taylor & Lasker 1988). After achieving financial security immigrants tend to consume items previously beyond their means, changing usually from foods rich in carbohydrates to items rich in fat and high in energy, protein and sodium (Wenkam and Wolff 1970, Freedman 1973).

The diets of later generations of migrants are found to be different from that of earlier generations. In a comparative study of the dietary patterns of three generations of Greek-American women, the food habits of third generation of migrants were found to be most acculturated and that of the 1st generation the least acculturated (Freedman and Grivetti 1984).

Although research done on offspring of migrants indicate that the diet of the immigrants' children is more adapted to the host culture than their parents diets, the degree of change is not necessarily the same for all the immigrant groups living in same area. In a study of food habits of Muslim South Asians in UK the second generation of all three subgroups studied (Pakistanis, Bangladeshis and Ismailis) were found to be more westernised than that of the relevant first generation. The Ismailis were most acculturated in their food habits and Bangladeshis the least, with Pakistanis being intermediate (Kassam-Khamis, 1996).

Differences were also found to exist in the dietary patterns of the second generation of South Asians Gujaratis in UK as compared to British Caucasian adolescents. In a comparative study of British Caucasian and Gujarati Asian adolescents in London the two groups were found to have similar meal patterns with regards to snacking and skipping meals. Foods eaten as snacks were found to be similar while those eaten at meals were different. The evening meal of South Asians contained twice as many traditional items as did lunch. Breakfast included the fewest traditional items. Furthermore there was variation in the amount of traditional foods included in meals within the Gujarati sample itself (Patel 1994).

- ***Migration and health***

Migrants are susceptible to the diseases of the place of origin and their new environment. Studies (Kaplan, 1988; Marmot et al, 1984) have shown that migrants tend to bring with them the particular disease risks of their homeland and also in time (1 or 2 generations) come to adapt to the pattern of illness which is more typical of the place to which they move i.e. a decrease in nutrient deficiency diseases and increase in diseases of affluence in the case of migration from less affluent to more affluent societies.

1.2 The case of South Asians in UK.

1.2.1 Background

Two major accounts now exist of the growth of Britain's South Asian population (Visram 1986, Fryer 1984). Both stress that Indian migration to Britain has not just been a twentieth century phenomenon, for an Indian population has been part of metropolitan society (as seamen, domestic servants, politicians, barristers, doctors and social celebrities) for almost three hundred years. However, the scale and nature of Indian settlement altered radically in the 1950s, with the development of mass chain migration. South Asians were no longer migrating in search of qualifications and professional experience but to fill the gaps in the lower orders of the British labour market. Migrants were largely unskilled and were drawn from specific areas of origin, sometimes even group of villages.

The most reliable Government statistics now indicate that the South Asian population in Britain numbers some 1,572,000 of whom 844,000 are Indians and 725,000 are Bangladeshis / Pakistanis (OPCS 1990). Of these totals 40%, 45% and 30% respectively are now UK born second generation (CSO 1992). In total the South Asian population constitutes 2.8% of the British population. Fertility rates still exceed those of the white population with total period fertility rates of 4.6 births for Pakistanis, 2.1 births for Indians and 1.8 births for Britons as a whole (CSO 1993).

Chain migration from particular regions and villages and the concentration of industrial sectors within parts of the UK ensured a high degree of spatial clustering of South Asians in the early 1970s. Indeed the 1971 Census found 65% of Pakistanis and 58% of Indians to be concentrated into the six English conurbations alone; these consist of Greater London, West Midlands, Greater Manchester, Merseyside, Tyneside and West Yorkshire. Within these London was the dominant centre for both groups (with 33% of Indians and 22% of Pakistanis). South Asian settlement was prominent in the textile towns and heavy engineering towns and was relatively absent from service centres and newer industrial settlements (Robinson 1979)

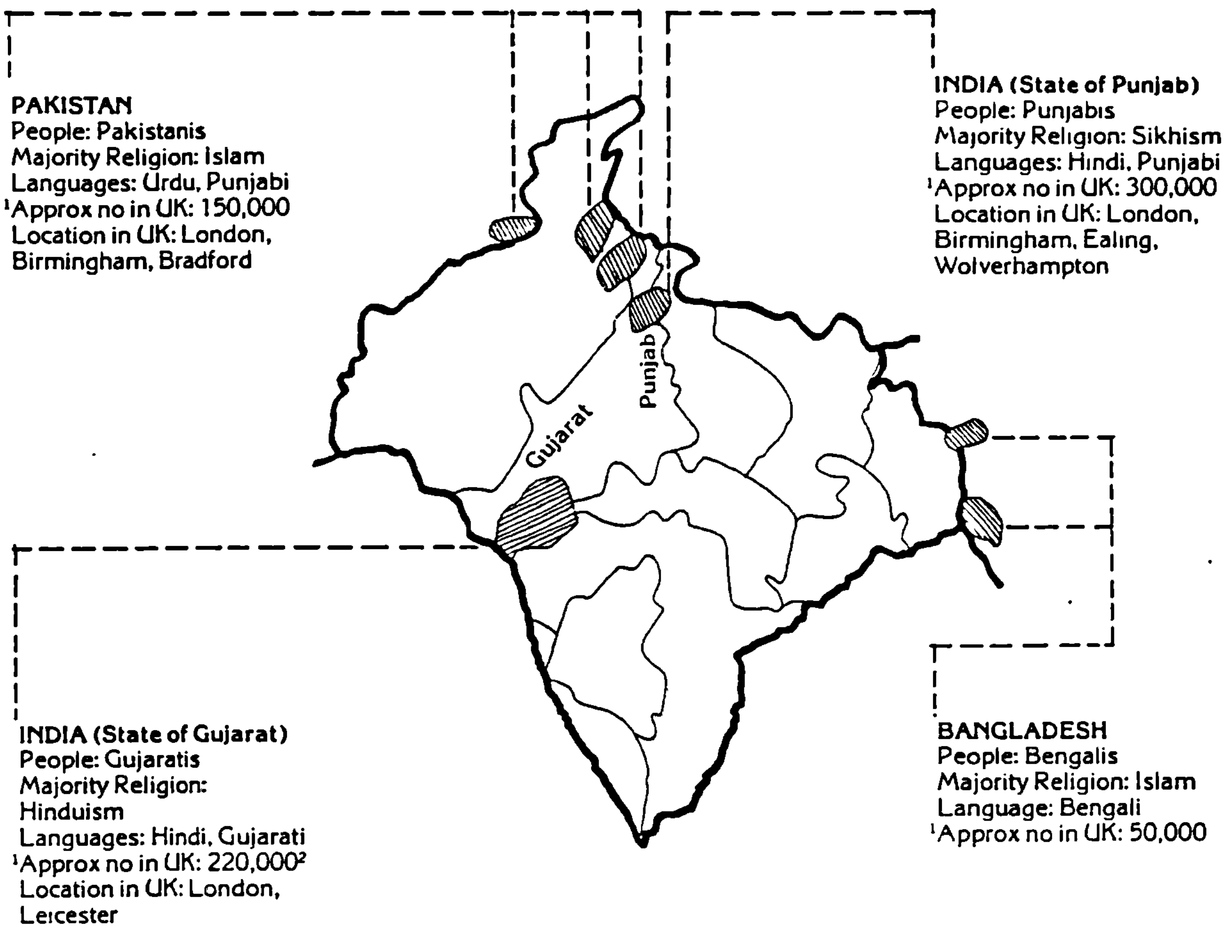
Within these centres, patterns of residential concentration also reflected the economic nature of migration. Asians characteristically lived in those districts which enriched the commercial heart of the city, where they were in close proximity both to public transport and to places of work such as foundries and textile mills. A combination of exclusion from large parts of the housing market and a desire to retain community encapsulation ensured levels of segregation which exceeded those for most other ethnic groups.

1.2.2 CHD mortality among South Asians in UK

Migrants are commonly observed to acquire the disease pattern of the host environment (Mascie-Taylor & Lasker, 1988) but in the case of South Asians in UK the severity of certain health problems has superseded that in the host population.

Higher rates of CHD among people of South Asian origin in UK were first recorded in 1971 (Tunstall-Pedoe et al 1975, Marmot et al 1984, Balarajan 1984). Between 1979 and 1983 the relative risk of death from CHD, compared with the national average for England and Wales was 1.4 in men and 1.5 in women (OPCS 1990). In analysis of local hospital admission data, admission rates for myocardial infarction have consistently been found to be higher in South Asians than in Europeans. The relative risk in South Asian men compared with European men was estimated to be 1.5 in Leicester during 1977-78 (Donaldson & Taylor 1983) and 1.9 in Birmingham during 1986-87 (Hughes et al 1989). A much higher relative risk was also reported from a study in north-west London during 1985-87 (McKeigue and Sevak 1994).

Figure 1-3 Map Of The Indian Sub-Continent



1: These figures are estimates and include children born to immigrants in Britain
2 75% of East African Asians are of Gujarati origin Their numbers in Brita n are included in this figure
From: Rose, 1969.

Henley,A (1981) *Asians in Britain*. London: National Extention College, DHSS, King's fund

These high rates of CHD among South Asians in the UK are part of a wider phenomenon affecting people of South Asian origin around the world (McKeigue et al 1989). Recruitment of Indians as plantation workers during the colonial period led to the establishment of Indian populations in Fiji, Singapore, Mauritius, South Africa and the Caribbean (Tinker 1974). From the 1950s onwards reports began to appear of unusually high rates of CHD in South Asian people settled overseas in comparison with other groups in the same countries (McKeigue et al 1989). More recently it has been reported that CHD rates are high among South Asians in the Unites States (Kaltsky et al 1993) where large scale migration from the sub-continent has been underway since 1965.

According to the latest estimates in the UK, mortality rates from coronary heart disease for those born in the Indian sub-continent are 35% higher among men and 46% higher among women, compared with rates for England and Wales as a whole (DoH, 1996). According to the latest estimates available (Balarajan 1991) the standardised mortality ratio for coronary heart disease for men and women from the Indian subcontinent is 136 and 146 respectively. Between 1979 and 1983 age- standardised coronary heart disease mortality was also higher in men and women of South Asian origin than the general population of England and Wales, irrespective of social class or religious group (Williams 1995).

Although the overall rates of coronary heart disease mortality have declined by 5% in men and by 1% in women in UK from 1970 to 1980, coronary heart disease mortality has increased by 6% in men and by 13% in women among South Asians in the UK (Balarajan 1991).

Based on the observation that more South Asians have been refused coronary bypass surgery because of the severity of their disease Lowry et al (1983) concludes that coronary heart disease is more severe in South Asians than in whites in UK. But the possibility of variation in access to treatment cannot be excluded. As in another study Shaukat et al (1993) found that average interval from onset of symptoms to consultation with a cardiologist is longer for South Asian than white patients undergoing angiography.

1.2.3 CHD risk factors in South Asians in UK

- *Diet*

As there are no longitudinal studies of South Asian migrants, nothing is known about their past diets; neither has there been any attempt made to assess or compare the extent of arterial damage occurring in apparently healthy South Asians, nothing can be said about the relative role of South Asians' past dietary and other lifestyle habits in the current state of CHD fatality among them.

Table 1- 2 shows the differences found by various researchers in certain CHD risk related dietary characteristics of South Asians in comparison to British Caucasians. In general, South Asians are found to consume less saturated fat (SFA), more polyunsaturated fat (PUFA) and more dietary fibre than British Caucasians. However sub-ethnic differences in the consumption of PUFA are also noted. Indian Gujaratis have higher intake of PUFA than other South Asians (Pakistanis, Indian Sikhs).

Table 1-2: Summary Of Fat And Fibre intakes Of South Asians As Compared To British Caucasians

Authors	Groups Studied	sex	Methods	% energy from fat		% energy from saturated fat		% energy from PUFA		Dietary Fibre (in gms)	
				South Asian mean	British mean	South Asian mean	British mean	South Asian mean	British mean	South Asian mean	British mean
McKeigue et al, 1985	Gujarati Hindus	M & F	household food inventory	39	42	14	18	10	6		
Miller et al, 1988	Indians	M	weighed intake	38	38			29		17	16
Reddy & Sanders, 1992	Gujarati Hindus	F	weighed intake	38	40	11	16	8	6	29	23
Smith et al, 1993	Pakistanis	M	weighed intake	42	39	16	17	7	6	29	20
	Gujarati Hindus	M	weighed intake	39	39	15	17	10	6	39	20
Sevak et al 1994	Punjabi Sikhs	M		37	40	16	18	8	7	29	22

The limitation of these dietary studies is that none of them have taken into account the past diet or longer term food consumption patterns. Lack of information about the constituents of asian foods further limits the validity of the conclusions and failure in many studies to distinguish between sub-ethnic groups makes interpretation difficult. Despite growing evidence concerning the role of trans fatty acids and antioxidants in the aetiology of CHD (Ascherio 1994, Magnusson 1994) little is known about consumption of these by members of South Asian groups in the UK. Consumption of trans fatty acids and antioxidant nutrients has not been examined in any of these studies. This aspect of asian diet merits further research.

The importance of differences in the type of fat consumption seems to be unclear at present. The studies done to date present a complicated picture. Peterson et al (1994) compared fatty acid composition of erythrocyte and plasma triglyceride of Gujarati Asian and European patients with NIDDM and suggested that a high dietary intake of linoleic acid may not be cardio-protective unless balanced by significant intakes of oleic and n-3 series fatty acids, at least in diabetic Indian patients and the conventional recommendation to substitute PUFA for SFA in the diet may be inadequate to reduce thrombogenesis and the overall balance of fatty acids including mono-unsaturates should be considered. There is also some evidence that consumption of vegetable oils containing long chain PUFA may be a cause of increased CHD morbidity in urban Indians in India (Peterson et al 1994). Furthermore although it has been suggested that the presence of cholesterol oxides in ghee is associated with higher CHD mortality in South Asians in UK (Jacobson 1987), others (Nath and Murthy 1988) present evidence that normal ghee samples acceptable for consumption, do not contain cholesterol oxidation products. None of these issues have been investigated sufficiently to reach any conclusions. Clarification of these issues seems to be important for understanding the association of diet and CHD in South Asians in UK and in the Indian subcontinent.

- ***Alcohol***

Although there are sub-ethnic variations, South Asians consume alcohol much less frequently than British Caucasians (Balarajan & Yuen 1986) in a study by Smith et al (1993), 72% of Hindu men drank alcohol compared to only 3% Muslims. Among South Asians, males are more likely to drink alcohol than females and heavy dnnking (spirits) is most common amongst Sikh men (McKeigue and Karmi 1993, Ahmed et al 1988, William et al 1994, Denscombe 1995). These findings suggest that alcohol consumption does not play an important role in the high risk of CHD among Asians.

- ***Smoking***

Smoking rates are found to be lower in most South Asian migrants in UK (Lip et al 1996, Ahmad et al 1988, Knight et al 1993, Lowry et al 1983, Lowry et al, 1984, McKeigue et al 1988, 1991, Balarajan and Yuen 1986). Miller (1988) found the smoking rates for Indian, West Indian and Europeans to be 21, 46 and 40% respectively. Other studies found that nearly 30% of Hindus and Pakistani Muslims smoke, while smoking rates are found to be very high among Bangladeshi men in UK (McKeigue et al 1988, Silman et al 1985) and in Bangladesh (Cohen 1981) However there is at least one report (Ahmed et al 1988) of Pakistani men smoking more often (42%) than the national average 31% (White et al 1993).

Those Asians who do smoke tend to smoke less tobacco (fewer cigarettes a day) than the white population (McKeigue et al 1988, Knight et al 1993, Balarajan and Yuen 1986).

1.2.4 Physical activity

Low frequency of leisure time exercise appears consistent with a high risk of heart disease amongst South Asians compared to non Asians (Knight et al, 1993, McKeigue and Marmot, 1991). McKeigue et al (1992) showed that average weekly energy expenditure outside the workplace was some 30% lower amongst South Asians aged 40-64 than Europeans in Southall. William et al (1994) showed that South Asian men in Glasgow were less likely to take exercise than the general population. Lip et al (1996) also reported less regular exercise amongst South Asian women and their husbands compared to White and Afro Caribbean housewives.

South Asians were found to be less active than British Caucasians by Smith et al (1993) and Shaukat et al (1995) also, but the differences were statistically significant only in the latter study. Repeated evidence of higher rates of central adiposity, (Wardle et al 1996, Bose 1995,) which in general is associated with a sedentary lifestyle also indicate that South Asians are likely to be less active than British Caucasian people.

- *Obesity*

Central rather than generalised obesity seems to be a general problem among South Asians. A number of studies have documented higher rates of central adiposity among South Asians (Wang et al 1994, McKeigue et al 1991, Shaukat et al 1995) but there seems to be a controversy about higher waist-hip ratio (WHR) as a CHD risk factor for South Asians. McKeigue et al 1991 suggest that central adiposity in South Asians may be linked to diabetic tendency and CHD risk in South Asians while Bose, (1995) on the basis of findings that central adiposity was significantly related to elevated blood cholesterol in whites but not in South Asians concluded that truncal obesity might not be a CHD risk for South Asians.

In a comparative study, Indians were found to be shorter and to weigh less than West Indians and Europeans. However skin-fold thickness was similar in Indians and Europeans and least in West Indians (Miller et al 1988). In another study, BMI of Europeans, South Asians and Afro-Caribbeans was found to be similar but waist-hip ratio was higher in Asians (0.98) in comparison with Europeans (0.94) and Afro Caribbean (0.94). Waist-hip ratio correlated with fasting triglyceride levels and also with the triglyceride response to a glucose load in this study (McKeigue et al 1991). On the other hand in a comparative study of 262 adult whites and 100 migrant Pakistan males, Bose and Taylor (1995) found that abdomen skin-fold was significantly associated independently of age and body mass index, with fasting blood glucose in whites but not in Pakistanis.

Central obesity is a stronger predictor of CHD than generalised obesity (Donahue et al 1987, Ducimetiere et al 1986, Lapidus et al 1984) The association of obesity with glucose intolerance, insulin resistance and other metabolic disturbances are stronger for central obesity than for peripheral obesity (McKeigue and Sevak, 1994).

At any given level of BMI South Asian men and women have thicker trunk skin-folds and higher mean WHR than Europeans. The ability to store fat quickly in intra-abdominal depots in times of food surplus, for mobilisation in times of food scarcity, may have been selected as a thrifty genotype (Neel 1962) in times when food supplies were unreliable. The relationship between central obesity and insulin resistance is not well understood but recent experiments support the hypothesis that insulin resistance may result from excessive store of fats in muscle cells (Storlein et al 1991).

- ***Non insulin dependant diabetes mellitus***

The diabetic tendency has been demonstrated for many different Indian origin subgroups living in diverse locations (Cruickshank et al 1980, 1989, Mather & Keen 1985). Much of the difference in mortality rates from CHD between Indians and Europeans could be explained by the high incidence of diabetes (Miller et al 1988). Excess of ECG abnormalities is found to be strongly correlated with glucose intolerance and hyperinsulinemia in younger South Asians (McKeigue et al 1993).

- ***Blood pressure***

South Asians are often found to have similar or lower values for blood pressure than that of Europeans (Cruickshank et al 1981, McKeigue et al 1988). Blood pressure has not been found to explain increased risk of CHD among South Asians (Silman et al 1987, Beevers and Cruickshank 1981, McKeigue et al 1988, 1991, Seedat & Seedat 1982). Miller (1988) found a marked excess of reported hypertension in Indians as compared to West Indians and Europeans but mean blood pressure was similar in all groups. The authors point out that the reason for this discrepancy was that large numbers of the Indians were taking hypertensive drugs.

- ***Blood lipids and coagulants***

The mean total plasma cholesterol concentrations of South Asians have been shown to be lower or the same as the national average at 6.6mmol/l, (Knight et al 1993, McKeigue et al 1985, 1988, 1991, Reddy and Sanders 1992, Miller et al 1984, 1988, Lowry et al 1984) and thus do not seem to account for the higher rates of CHD amongst South Asians. However there is some evidence of a similar association between raised plasma cholesterol and CHD among South Asians as in Europeans (McKeigue et al 1993, Hughes et al 1990). This suggests that South Asians might have a lower threshold and that progression of cardiovascular pathology may be activated by a comparatively lower level of raised plasma cholesterol.

A comparative study of immigrant Indian Sikh men in the UK and their siblings in India revealed that immigrant siblings had higher mean serum cholesterol than the ones still living in India (Bhatnagar et al 1995).
Although South Asians in UK are not found to have higher total serum cholesterol than British Whites they do tend to have higher levels of low density lipoproteins cholesterol (LDL-C) and lower levels of high density lipoproteins cholesterol (HDL-C) (Miller et al 1988, Hughes et al 1989, McKeigue et al 1989 1991, Knight et al 1993, Dhawan et al 1994, Bhatnagar et al 1995). As low density lipoproteins (LDL) are documented to be positively associated and high density lipoproteins (HDL) negatively associated with CHD this tendency among South Asians of having lower HDL and higher LDL merits further exploration in terms of its relationship to dietary and other factors.
Lipoprotein 'a' is thought to be more atherogenic than other lipoproteins (Scott 1991) and was found to be higher in Gujarati Hindu women as compared to European vegetarian women (Reddy and Sanders 1992), but not amongst Bangladeshis in comparison to Europeans (McKeigue and Sevak 1994).
South Asians, (Gujaratis, Bangladeshis and Pakistanis) are found to have plasma fibrinogen levels comparable to their European counterparts. (McKeigue et al 1989, Knight et al 1993, Miller et al 1988).

As classic risk factors fail to explain higher rates of CHD morbidity and mortality among South Asians in UK as compared to Caucasians it seems that rather than absolute level of dietary intakes and blood profiles for CHD risk, changes brought in diet and lifestyle as a result of migration might be responsible. As no research studies have looked at the degree of dietary and physical activity changes that occurred as a result of migration of South Asians to UK, there is not enough scientific evidence available to check this hypothesis but further research in this direction may compel us to agree with Hippocrates that "*it is changes that are chiefly responsible for disease, especially the violent alteration.*"

1.3 CHD Risk Factors in Children

Cardiovascular problems presenting in adult life are thought at least in part to have their origin in childhood. Pathological evidence that coronary atherosclerosis may have its origin in early life has been steadily accumulating since the reports by Enos et al (1953) of the marked changes in the coronary arteries of young American soldiers killed in combat in Korea. Stary (1987) has shown that early coronary artery lesions can be seen at autopsy in 17% of infants and children less than five years of age.

It is evident from the previous discussion that lack of information is a hindrance in understanding the factors responsible for higher CHD mortality among South Asians including Pakistanis in UK. Furthermore studies in younger groups are likely be have additional benefits to our understanding of the development of the condition.

In adults it is difficult to control for the confounding effects of past dietary and exercise habits and duration and extent of cardiovascular pathological events which have already occurred. Children from a certain socio-economic or cultural group are likely to vary less in this regard as compared to adults.

Another advantage of studying younger groups is that there is more potential for change; it is easier to modify eating and exercise habits at younger ages. Adapting healthier lifestyles at younger ages may prevent or at least delay initiation of cardiovascular pathology. A review of research is presented to highlight the importance of studying CHD risk factors in children.

- ***Tracking of CHD risk factors***

Tracking describes the degree of continuity with time for any biological variable. Measurement of tracking can be done by using Spearman's correlation which gives a measure of the goodness of fit to the hypothetical channel of a group of subjects.

By the 1970's widespread interest in the evolution of risk markers for cardiac disease resulted in a number of population based studies being initiated to study different aspects of the problem in childhood. These included the Bogalusa (Freedman 1985, 1987, Croft, 1986), Muscatine (Lauer 1988), Princeton (Laskarzewski 1979) and Tecumseh (Johnson 1965, Garn 1980), studies in the USA, the Multi-Centre Finnish Study (Viikari et al

1985), Amsterdam Growth and Health Study (Kemper et al 1990, Twisk et al 1996a, 1996b) and Australian study (Boulton & Magarey 1987).

In the Bogalusa Heart Study 'Persistence in ranks' (tracking) for cardiovascular disease risk factor variables was examined in 2236 children who were screened three times over a five year period. As expected, the greatest persistence was noted for height (r=0.47-0.99) and weight (r=0.70-0.96). Correlation coefficients for systolic blood pressure and diastolic blood pressure ranged from 0.38 to 0.66 and 0.22 to 0.49 respectively. Among lipids, the correlation was highest for serum beta lipoprotein cholesterol ranging from 0.62 to 0.78. For those children who were at or above the 90th percentile on a risk factor variable during the first examination, a tendency to retain their ranks in the second and third examination was noted (Webber et al 1983).

In the Amsterdam growth and health study a population of 93 males and 107 females was measured annually from 1977 to 1980 and a fifth measurement was made in 1985. In that way longitudinal data covering a period of 8 years was collected for a group of adolescents/adults between 13 and 21 years of age. The stability over the nine years of tracking cardiovascular disease indicators, measured as the inter-period correlation, was fairly high. It varied from 0.4 to 0.8 in percentage body fat, cholesterol and VO2 max. Blood pressure correlation values were low (between 0.3 and 0.4). Of the three environmental cardiovascular disease indicators (smoking, physical activity and type A/B behaviour) measured in 1985, only physical activity was significantly correlated among males and females with high density lipoprotein cholesterol, percentage body fat and VO2 max. (Kemper 1990).

Twisk et al (1996a) (Amsterdam study) carried out tracking analysis of total serum cholesterol (TC), HDL-C, TC/HDL-C ratio and concluded that tracking coefficient for total blood cholesterol and TC/HDL-C ratio was higher than the coefficient for HDL-C. The changes in total blood cholesterol were positively influenced by both body fatness and daily physical activity and the changes in the TC/HDL-C ratio were positively influenced by body fatness and inversely by physical activity at the age of 13 years. The authors suggest that the inverse relationship between physical activity at age 13 and total blood cholesterol at age 27 may be due to the enormous decrease in physical activity in the study population during the 15-year period under consideration.

Twisk et al (1996b) in another report from the same study concluded that body fatness was related to a high risk profile with respect to hypercholesterolemia and cardio-pulmonary fitness to a low risk profile.

It seems that while many of the CHD risk factors track from childhood into adulthood, fatness during childhood is a strong predictor of later CHD risk. It is probable that relationship between obesity and other CHD risk factors may be found even during childhood.

- ***Obesity***

Studies cited above indicate that childhood obesity is a strong predictor of adult CHD risk status. It is also documented that cardiovascular risk levels in children are associated with obesity (Rona et al 1996, Resnicow & Morabia 1990, Williams et al 1992, Newman et al 1990). However the basic assumptions regarding aetiology, prediction and preventability of obesity still remain unsettled.

Durnan-Tauleria et al (1995) reported that the only factor associated with all measures of fatness in a study of 8374 British children, was the parent's BMI.

Rolland-Cachera and Bellisle (1986) reported no relationship between body mass index and skin-fold thickness with energy intake in 7 to 12 year old children. Sunnegardh et al (1986) also showed no relationship between body mass index in 8 year old boys and girls and 13 year old boys with energy intake, although a significant negative correlation was reported for the thirteen year old girls. Studies that compared energy intake of lean and obese children have generally not shown that obese children have higher energy intakes than lean children (Johnson 1956, Stefanik et al 1959, Bradfield et al 1971, Durnin et al 1974, Wilkinson 1977, Gliksman et al 1993, Rona et al 1996).

Muecke et al (1992) found that neither high fat food intake, nor reported level of physical activity were independent risk factors for obesity. However these authors suggest that they may exert a synergistic effect when both are present in the same child.

Astrup et al (1992) reviewed research work done on the relation of energy consumption from total fat and carbohydrates to obesity in adults and concluded that subjects with a genetically determined predisposition to obesity become obese when they are exposed to a particular range of environmental conditions. The available knowledge suggests that the genetic propensity to weight gain is caused by a susceptibility to dietary fat due to an impaired capacity to increase their lipid/ carbohydrate oxidation when fed a high fat/ low carbohydrate diet. This in turn promotes lipid storage, depletion of carbohydrate stores and increases appetite. However by decreasing the ratio of fat to carbohydrates, macro nutrient balance may be achieved with a high energy expenditure.

Assuming this hypothesis to be true, contradictory evidence regarding predictability of obesity in not unexpected. Serdula et al (1993) reviewed epidemiological studies published between 1970 and 1992 and showed that while in most studies correlation between childhood and adult obesity was positive (but covering a wide range from r= -0.04 to 0.84) in all of the studies in which the question could be addressed the majority of obese adults were not obese as children. Furthermore since it has been found that overweight adults who were underweight as a child had a higher risk of diabetes (Horlbrook et al 1989) and higher rates of hypertensive complications (Abraham et al 1971), Serdula et al (1993) concluded that the risk of obesity related chronic diseases may be higher among obese adults who were not obese as children. They further suggest that while programmes need to be developed for preventing adult obesity, good nutritional and exercise habits should be emphasised in all children whether or not they are obese.

- ***Hypertension***

Although the prevalence of clinical hypertension is of a far lesser magnitude in children than in adults, there is ample evidence to support the concept that the roots of essential hypertension extend back into childhood (NHLBI 1987). Whincup et al (1989) studied children from nine British towns. Three towns had high, 3 had intermediate and 3 had low adult blood pressure levels observed in an earlier study of middle aged men. The pattern of systolic blood pressure differences in children was similar to that observed in the study of middle aged men (r=0.65). The mean systolic blood pressure in children according to town, showed an association with standardised mortality ratios for cardiovascular disease in adults.

- ***Blood cholesterol***

The uptake of cholesterol in the vessel wall is the initiating factor in the formation of the atherosclerotic lesion and the subsequent process advances more rapidly in individuals with raised concentrations of cholesterol in their plasma. A report from the Bogalusa Heart Study (Newman et al 1986) has shown aortic fatty streaks in young people dying before the age of 25 years (mean age at the death 18 years) to be strongly related to ante-mortem levels of both total and low density lipoprotein cholesterol. Hypercholesterolemia has long been recognised as a major risk factor for coronary heart disease in adults and amongst some of the earliest advice to paediatricians regarding their responsibilities in the prevention of atherosclerosis, was an encouragement to detect and prevent hyperlipidaemia (Kannel 1972). Many studies (Freedman 1987, 1985, Garn 1980) provide evidence that plasma levels of lipids and lipoproteins in children "track " and are thus predictive of adult level. In a study of 560 boys aged 7 to 8 years in 16 countries from different regions of the world selected on the basis of having different patterns of diet and different rates of mortality from coronary heart disease, Knuiman et al (1980) found a strongly positive correlation between the children's levels of total cholesterol and the prevalence of coronary heart disease in the adults.

- ***Blood glucose and insulin***

NIDDM has a strong familial component. Since NIDDM is essentially an adult onset disorder, little attention has been focused on children. However interest in this area seems to be developing. One study for which the complete results have not been published yet shows that the offspring of South Asians having coronary artery disease have lower insulin sensitivity than the offspring of Europeans (Shaukat & de Bono 1994). Berenson et al (1996) compared offspring of white diabetic (NIDDM) and non diabetic adults and reported that offspring of diabetics had significantly increased measures of body fatness; blood pressure and fasting levels of glucose, glucagon, insulin-C-peptide ratio and triglycerides. High glucose response and BMI were independently associated with parental diabetes. These results indicate that it is possible to identify abnormalities in some offspring of type II diabetics at an early age that may presage the onset of overt adult diabetes.

1.3.2 Nutrition and CHD risk

- ***Infant/ foetal origins of cardiovascular risk***

Recent epidemiological studies of the geographical distribution of ischaemic heart disease provide evidence of the role of early and probably nutritional influences. Barker and Osmond (1986) have shown a strong positive correlation (r=0.73) between current mortality from ischaemic heart disease and post/neo-natal mortality some fifty to sixty years ago. They argue that neonatal mortality is closely related to environmental factors such as nutrition and that in those areas with high neonatal mortality nutrition is likely to have been poor; 50 years later the long term consequences of this may be showing in adult disease and death. They postulate that one of the mechanisms may be an effect of the current diet of adults (high energy and fat) on the lipid metabolism of individuals "programmed" by the poor diets of their early childhood. Another study (Barker et al 1989) by the same group of workers has correlated weights at birth and one year of age in men with death rates from ischaemic heart disease 50-60 years later. Death rates were higher in the men who were lightest in weight at age one year and fell steeply with increasing weight, ranging from a standardised mortality ratio (SMR) of 111 in the lightest group to SMR of 42 in the heaviest group; the downward trend was statistically highly significant.

Barker suggests that the large falls in cardiovascular mortality in the USA, Canada, Australia and New Zealand during the past 20 years may have resulted from improved child growth and health, reflected in an earlier fall in infant mortality (Barker et al 1989). Further studies by Barker et al 1993a, 1993b, 1994, 1995, Osmond et al 1993, Martyn et al 1996, Frankel et al 1996a, 1996b, Stein et al 1996 have supported the hypothesis that low birth-weight/body-length in early life is associated with higher prevalence of CHD risk factors in adult life.

However numerous criticisms have been levelled at this work and Kramer and Joseph (1996) comment that neither perinatal nor cardiovascular epidemiologists have universally embraced the foetal/ infant origin hypothesis. These criticisms are founded on several major problems with the published work and they include inconsistencies in results and interpretations, conflicting evidence, residual confounding and the potential for selection bias. Despite the reservations, it is concluded by the commentators on this issue that studies done so far have yielded sufficient evidence in support of the foetal/infant origin hypothesis to justify further work by Professor Barker's group and their critics.

- ***Dietary patterns of children and their relationship to cardiovascular risk factors***

The role of diet in causing and maintaining raised levels of plasma total cholesterol and LDL in older children in now generally accepted, with a high intake of total and saturated fat and a low polyunsaturated to saturated ratio, being the major factors. The evidence is however based on epidemiological studies of populations; within such populations the correlation between nutrient intake and the concentration of plasma lipids and lipoproteins, though statistically significant tend to be rather small (Frank et al 1978). This is probably due, at least in part, to the inherent problems of dietary recall studies. Nevertheless the difference between diet and plasma cholesterol concentration in various countries is so great that the role of diet cannot be neglected. In the 16 country study (Knuiman et al 1980) a very high correlation was found between mean plasma cholesterol concentration and the availability of animal products and by inference a high saturated fat intake.

Whilst the current emphasis is on the deleterious effects of nutritional factors, especially in relation to the consumption of fat, on both plasma lipids and atherosclerosis, the beneficial effects of good nutrition in childhood must not be ignored. As Barker et al (1989) point out, a strong inverse relationship has been shown between adult height and cardiovascular mortality in England (Marmot et al 1984), Norway (Waaler, 1984) and Finland (Notkola, 1985). It is tempting to speculate that poor nutrition in childhood leading to poor growth and reduced adult stature may predispose individuals to risk factors predominantly acting in adult life.

In the Bogalusa Heart Study (Nicklas et al 1989) eating patterns were studied in 1275 adolescents and young adults (aged 12-24 yr.) Factor analysis of 64 foods consumed weekly revealed 17 eating pattern factors accounting for 57 % of the item variance. The factors were effective in discriminating eating patterns across race and gender. Eating patterns for persons in the upper or lower quartiles differed consistently for specific cardiovascular risk factors. Participants in the lower quartiles for serum triglyceride levels tended to consume more fruits and vegetables, less fat and pasta, more desserts, more diet drinks and sugarless gum and less milk than those children in the upper quartile for serum triglyceride level.

Participants in the upper quartile for HDL-C level tended especially to consume less fruit drink, less fats and pasta, more snacks, less salty tidbits, less coffee with cream and sugar and more fruits and vegetables than those in the lower quartile for HDL-C levels.

Doyle et al (1994) studied nutritional status and cardiovascular risk of children from an inner city area in London. The diets in general were found to be unhealthy according to government recommendations. Seventy four percent did not meet the recommended intake for fibre and a high proportion of children ate no fresh fruit during the week they kept a diary and only 19% had vegetables (fresh or frozen), other than potatoes, on a daily basis. Their main sources of energy were chips, bread and confectionery. No association was found between fat intakes and plasma cholesterol concentrations. A lack of association between cholesterol intake and plasma cholesterol was reported by Badruddin et al (1991) among well-to-do Pakistani children; although mean cholesterol intake as well as plasma cholesterol were found to be high (>400 mg per day and >4.4 mm/l respectively).

Resnicow (1991) reported that breakfast skippers had significantly higher blood cholesterol levels than breakfast consumers and among breakfast eaters, those eating high fibre cereals had lowest blood cholesterol levels. Higher blood cholesterol levels in breakfast skippers may be related to distribution of nutrient intake throughout the day, or could partly be explained by their higher body weight.

In a study of 1017 12 and 15 year old Austrian children Gliksman et al (1993) found that the proportion of energy from saturated fat and nutrient density of fibre were positively associated with serum total cholesterol. The proportion of energy from mono unsaturated fats was negatively associated with serum triglycerides. No significant association was found between dietary composition and serum HDL-C, but the proportion of energy from saturated fat was positively associated with serum LDL-C. The dietary P:S ratio was negatively associated with the ratio LDL-C/HDL-C. Subjects of this study represented various ethnic and socio-economic groups. As the authors indicate, these results suggest that class differences in cardiovascular risk arise from dietary differences that are present from an early age. The reason that other researchers (Badruddin et al 1991, Doyle et al 1994) did not report an association between diet and blood lipids may be that in those studies subjects represented a limited socio-economic group.

1.3.3 Physical activity and cardiovascular risk

Sallis et al (1988) studied associations of physical activity and cardiovascular fitness with cardiovascular disease risk factors in adults and children of both sexes. For all subgroups, fitness was strongly and significantly correlated with virtually all risk factors (blood pressure, HDL cholesterol, HDL: LDL ratio and BMI) After adjustment for body mass index most fitness-risk factor associations were no longer significant. Seven day energy expenditure was significantly correlated with HDL/LDL only in female adults and children. The activity rating was significantly correlated with body mass index in all subgroups and with HDL/LDL in female adults and male adults. The simple activity rating tended to be correlated with fitness. The pattern of association was similar for adults and children.

The Oslo Youth study (Grethe, 1988) examined aerobic fitness, self-reported physical activity and cardiovascular disease risk factors in adolescents. For both genders, fitness level was significantly and inversely related to body weight, body mass index, triceps skin-fold thickness, systolic and diastolic blood pressure and pulse rate and positively related to high density lipoprotein/total cholesterol ratio and physical activity.

Kerry & Andrew (1992) studied the activity level, physical fitness, lipids and obesity of adolescents with a parental history of coronary artery disease (CAD). Thirty six children of affected parents and 29 comparison subjects participated in the study. Total and LDL cholesterol was higher in girls with a parental history of CAD. The sample size was too small to draw any definitive conclusions about differences based on parental history in lipids or fitness in boys, or obesity in both genders. Overall, joggers were more fit and less fat than non joggers. Girls playing organised sports were more fit and less fat than non participants. Aerobic fitness correlated negatively with obesity in both genders; fitness was independently associated with HDL cholesterol only in boys. The authors conclude that the relationship between parental history of premature coronary heart disease, exercise, lipids and obesity may be gender specific.

The relationship between physical activity and body weight or body fat in children is not clear. Results have been inconsistent and have not generally demonstrated a significant inverse relationship between physical activity and body weight or body fat (Sunnegardh 1986, Ku et al 1981, Sallis et al 1988). Inconsistent results have also been reported in studies comparing lean and obese children. Some studies show that lean children are more physically active (Johnson et al 1956, Bullen et al 1964, Tell & Vellar 1988) whereas others do not show a significant difference (Stefanik et al 1959, Bradfield 1971, Wilkinson et al 1977, Strazullu 1988) More recently some reports have linked television watching with obesity in children (Obarzeneck et al 1994).

The results of a large study of 2379 black and white girls aged 9-10 years conducted by the National Heart, Lung and Blood institute, showed that age, the number of hours of television and video watched, the percent of energy from saturated fat and the activity pattern scores, best explained the variation in body mass index and sum of three skin-fold thickness measurements for black girls. The best model for white girls include age, the number of hours of television and video watched and the percent of energy from total fat (Obarzeneck et al 1994).

1.4 Conclusions

From this review it appears that in a group where there has been no intervention, the prevalence of a similar lifestyle and physical risk factors for CHD are similar in adults and the younger population. Comparison of CHD risk in genetically similar sub-groups and in twins show that the similarities in risk factors among younger people is not entirely due to genetic factors. Even at younger ages there is probably a relationship between lifestyle and CHD risk. Longitudinal studies and intervention trials indicate that changes in lifestyle accompany changes in CHD risk (or mortality). Psycho-social research indicates that pre-adolescence and early adolescence is the period when children's lifestyle habits are shaped. In view of high rates of CHD mortality in Pakistanis in UK and increasing CHD morbidity in urban areas of Pakistan information about diet and exercise habits and CHD risk status of younger Pakistanis in both countries would be invaluable. It may help in understanding the association between diet, lifestyle and CHD in Pakistanis in general and provide a basis for guidelines for the young Pakistani population for the prevention of CHD.

Comparing the rural and urban Pakistani population is likely to be of vital importance in this regard. Assessing CHD risk in South Asians according to standards derived from and found to be applicable to Europeans or Americans may be obscuring some diet-disease relationships. Biologically, similar pathological events may be taking place at lower threshold levels. In other words not the absolute level but the simultaneous presence of different risk factors in a particular proportion may be triggering cardiovascular pathological events in South Asians whether they are living in their home countries or elsewhere. In the case of immigrants to UK (or other countries) the sudden change in lifestyle may have further complicated the issue.

McKeigue et al., suggested in 1991 "*NIDDM and other disturbances associated with insulin resistance in South Asians overseas are probably consequences of low physical activity and high energy intake in populations adapted to survival under conditions of unreliable food supply and physically demanding work. Comparisons of rural and urban populations in India may help to clarify this hypothesis*" (McKeigue et al 1991) If within a group which has a similar genetic and cultural background, variations in lifestyle are found to accompany variations in CHD risk the hypothesis even if not entirely proven gets enough support to merit further testing.

The problem is that in South Asian countries such information is lacking. In developing countries emphasis is still just on malnutrition and infectious diseases. In spite of evidence for a global increase in risk for chronic diseases, national surveys do not yet seem to pay due attention to risks for these diseases. At a smaller scale the above mentioned hypothesis can be explored by considering people who have migrated to the UK and various groups within the home country itself. Some studies of this nature have been done among Indians and have found that the studied CHD risk factors were elevated in immigrants as compared to sedentes (Singh & Harrison 1996, Bhatnagar et al 1995). No similar research has been done among Pakistani migrants or their offspring.

Statement of hypothesis

That there are similar differences in diet and exercise patterns of children when comparisons are made between rural and urban groups made in Pakistan and between rural children in Pakistan and children of migrants to the UK and that these are accompanied by differences in group profile of CHD risk factors.

It is expected that the type of differences in diet and exercise habits between rural and urban children in Pakistan will be similar to those changes seen to accompany industrialisation and urbanisation in other countries.

That diet and exercise habits and CHD risk indicators of British Pakistani children in UK are different from that of rural Pakistani children, (the type of population their parents originally came from) but are not the same as British Caucasian children in UK.

1.5 Aims And Objectives

The present study was designed to fulfill the following aims:

1. To examine and compare patterns of activity, diet and CHD risk factors in groups of children from different backgrounds in Pakistan, children of South Asian migrants (including Pakistanis) and Caucasians in the UK.

In order to achieve these aims the following objectives were set;

1. To examine the patterns of diet, exercise and CHD risk factors in rural and urban Pakistani children.
2. To examine the patterns of diet, exercise and CHD risk factors in British Pakistani children and to compare these with patterns of Pakistani children in Pakistan.
3. To compare the patterns of diet, exercise and CHD risk of British Pakistani children with British Caucasian children and other South Asian children living in the same area.

Furthermore, in order to facilitate the development of appropriate approaches to intervention an additional objective was:

4. To compare beliefs and knowledge concerning diet, exercise and CHD risk among children in Pakistan and UK.

2. METHODS

For this study it was necessary to collect information about the dietary, activity, anthropometric, biochemical and behavioural characteristics of children. This chapter discusses the choice of methodology available for obtaining these five types of data and describes the methods of data collection and analysis used in this study.

2.1 Methodology

2.1.1 Assessing dietary habits and food and nutrient intakes

Food consumption data are collected for a variety of purposes. Before commencing any food consumption study or survey, it is important to define the purpose (Cameron & Van Staveren 1988). The choice of methodology for studying dietary habits and food intake vary with the background information already available and with the objectives of the investigation (Black 1982). For comparing food and nutrient intakes of groups it may be sufficient to use methods to collect food consumption data which provide an adequate level of accuracy in relation to group averages, but if the relationship between individual diet and health is being investigated a more accurate method of data collection is required (Cameron & Van Staveren 1988).

For the design of any study it is essential to decide first on the type of information needed. Dietary studies collect information for the purpose of studying any one or more of the following aspects of respondents' diet: eating patterns, food consumption and nutrient intake. For studying eating patterns qualitative information about the types of food eaten, time, place and style of eating and serving foods (alone or with family, from the same plate or separately, etc.) are usually required. Studies focusing on quantitative aspects of food consumption require information about both type and amount of food eaten. Quantitative information about food consumption can be used for calculating nutrient intake also but if the data is intended to be used for this purpose relatively detailed information about type of foods is needed and quantification of foods must be more accurate.

Cameron & Van Staveren categorise types of information which could be required into four categories;

1. mean food consumption of individuals,
2. mean and distribution of food consumption in a group,
3. the relative magnitude of the food consumption of an individual as belonging to a certain third or fifth of the distribution of intakes,
4. the absolute magnitude of average food consumption of an individual.

Different methods are available for the collection of these four types of information. Before making a choice of method four important points to be considered are: the purpose of the study, accuracy of the methods, the target group and availability of resources. The most cost effective methods can then be found. Some methods would be excluded because they are too inaccurate to fulfil the purpose, are unsuitable for the target group or are too expensive for the available resources. The advantages and disadvantages of remaining methods should be balanced against the priorities of the study. It should be considered for example, whether it is more important to have a high participation rate or more precise information on the weights of the foods eaten.

Any method consists of two components: collection of data and conversion into nutrients

While measuring dietary intakes of children in addition to the problems of food recall and recording, which are commonly encountered in measuring adults' dietary intakes, problems with children include low literacy, lack of knowledge of foods and food measurement, lack of experience in food preparation, lack of familiarity with components of mixed dishes and added ingredients, general lack of interest and short attention span (Wyender 1990). Dietary assessment among children is also likely to be influenced by multi-environmental influences on their food choices (Frank1994).

The observation method provides interesting possibilities for obtaining more accurate dietary assessment of children by avoiding errors of recall. Observation, however is an expensive, time consuming method which is not appropriate for large scale studies. Some form of self report seems appropriate for most dietary assessment needs among children. (Baranowski 1994). Children over 8 years of age can present valid reports of foods consumed in the previous 24 hours, particularly if careful probing is used (Aselbergs 1988). Keeping of records is obviously dependent on the writing skills of the child.

Crawford et al (1994) compared 3-day food records, the 5-day food frequency method and the 24-hr recall with unobtrusive observation by trained nutritionists at school lunch time and concluded that the 3 day food record was the best overall choice for assessing food intake. The three day food records were found to have a lower proportion of missing and phantom foods and the lowest level of quantification errors as compared to other methods (Crawford et al 1994).

In general methods can be divided into two basic categories; prospective and retrospective methods.

Prospective methods:

Seven day weighed intake: Usually considered 'the gold standard' for the assessment of nutrient intakes, this has certain definite advantages like being more accurate, but is costly in terms of time and money and requires a high degree of subject motivation and support and skills in weighing and recording foods. It requires a higher degree of co-operation from subjects than some other methods, because when keeping weighed records the subjects do most of the dietary survey work themselves. This is likely to affect the response from randomly selected samples unless great care is taken (Cameron & Van Staveren 1988).

Weighed dietary surveys do have a greater risk of bias although it is sometimes not as great as suggested. Persistence in recruiting, payments or gifts in return for the subjects time, as is done in other research studies are vital for the success of epidemiological studies.

Estimated records: Because of convenience these are particularly well suited for collecting cross sectional data. Open or closed forms may be used. An open form is used more often because there are no restrictions as to description of portion sizes given. The design of the form depends on the aim of the study, the kind of information required and the expected accuracy of the measurements made. They should be pre-tested in a small pilot study. The record books should be of a convenient size. Checking of records at a final interview is suggested.

Portion sizes are best described in terms of the subject's own household utensils. Any measuring utensil provided by the investigator could alter usual serving habits. Description in terms of standard portions should not be used unless they are familiar and widely used in the study area.

The main advantages of this method are that it is simple, less demanding for subjects than weighed records; allows rapid and low cost assessment of diets from large number of subjects, because scales are not needed; co-operation rates are likely to be higher than for weighed surveys. The main disadvantage of using household measures is loss of accuracy when compared with weighed portions. For groups the error may be small and of little importance, but for individuals it may be large (Cameron & Van Staveren 1988).

Along with food consumption, it is also possible to get information about other aspects of dietary behaviour, such as meal times, place of eating, on the same record form on which details of foods are written. In this way valuable information about eating behaviour could be obtained without a substantial increase in respondent burden. As the information is provided along with the foods consumed it provides excellent opportunities to relate food consumption to meal patterns.

<u>**Retrospective methods**</u>:

Twenty four or forty eight hour recall: Another option for investigators is to ask the subjects to recall their diet for the immediate past 24 or 48 hours. It has several practical advantages. It is quick and simple to perform, places a minimal burden on the subject and is applicable to most target groups regardless of their background. The recall method depends on the subjects ability to remember and adequately describe his/her diet. Obviously the demand on the memory is greater if the recall period is longer than 24 hours. Because of large intra individual or day to day variations found in many groups, repeated 24 hour recalls are often necessary (Cameron & Van Staveren 1988).

Food frequency questionnaires: These estimate how frequently certain foods are eaten during a specified period of time and this forms the basis for estimating intake of specified nutrients. This method is cheap, simple and quick but the development of the questionnaire is difficult and tedious work. Furthermore the data collected with the questionnaire is rather limited and for most questionnaires excludes the possibility of analysing the data in relation to other dietary components, about which questions were not asked.

The relative validity of food frequency questionnaires estimating a limited number of dietary components is in general, better than the relative validity of the food frequency questionnaires trying to estimate the whole diet. (The fewer the nutrients under consideration the greater the relative validity) The validity of the questionnaires is limited to the type of population for which it was validated. For other groups differing in cultural background, or age a different repertoire of foods may be required.

There is no 'best method' for all study purposes. A combination of two methods might give more information or might make a study easier to carry out. Since this study was concerned both with eating habits and differences in nutrient intakes between groups, two independent methods to assess dietary intake were used.

In this study for the purpose of getting more precise information about food intake which could be used for assessing nutrient intake, as well as describing eating patterns three day food records were obtained. A food frequency checklist (developed by the University of Exeter for British children, Balding 1994) was also included in the questionnaire, to give more general information about patterns of food intake.

2.1.2 Physical activities and energy expenditure

In adults common ways of acquiring data on physical activity are 1) by questionnaires or records, 2) by some form of measurement of movement, 3) by heart rate recording and by 4) direct measurement of energy expenditure (Scrimshaw & Schurch 1990).

The assessment of physical activity in infants and children is difficult but nonetheless feasible. For most purposes one or a combination of various techniques can be employed. Careful and appropriate use of these methods will allow collection of reasonably detailed data. The exact form of the detailed data will vary with the objectives of the study. In most cases it is likely that from the age of young adolescence there are no major differences in the assessment of energy expenditure from adults. (Scrimshaw & Schurch 1990)

The most common approach to estimating energy expenditure is the factorial method, in which the different components of energy expenditure are separately determined. Basal metabolic rate (BMR) can be measured directly by indirect calorimetry or can be calculated from standard equations based on measurements in a large number of similar subjects. An extensive compilation of data, based on a world-wide survey of some 11000 technically acceptable measurements on individuals of all ages and both sexes was made by FAO/WHO in the 1980s (Garrow and James 1994).

Once BMR has been measured or predicted, it is necessary to add on the energy required for physical activity and other thermogenic processes. The energy cost of physical activity can be measured directly by indirect calorimetry, although to do this for all the major activities of each subject is a painstaking task; the alternative is to estimate the energy cost of each activity from tables. The most comprehensive set of tables of energy cost of activities for adult is provided by Schofield and James (1990). This compilation expresses the energy cost of activities as multiples of BMR for men and women, allowing one value to be given for each activity which can be applied to all individuals of any body weight and any age group. If the duration of each activity is known, its energy cost can be determined from this multiple and the assured or predicted BMR of the subject. In this way the body weight of the subject is taken into account in the estimate of energy expenditure in activity.

The estimation of duration of different physical activities can be made either by retrospective recall by the subject, by an activity diary kept by the subject, or by time and motion records kept by an unobtrusive observer. If no such information is available, a crude estimate may be made from knowledge of the subjects' lifestyle.

The energy requirements of adolescents estimated by the factorial method should also include an allowance for the energy cost of tissue deposition. In normal growth, weight gain can be assumed to require 1 KJ per gram of tissue deposited. By assuming appropriate rates of growth and standard patterns of physical activity, the energy requirements of adolescents are estimated to be around 1.65 by BMR for boys or 1.57 by BMR for girls (Garrow & James 1994).

In epidemiological studies, activity frequency questionnaires, self reports and seven day recall interviews are often employed, to estimate the energy expenditure level of children (Badruddin et al, 1991, Stewart & Goldberg 1992, Tell & Vellar1988, Sallis et al 1988).

Attaining and maintaining a high level of motivation from children is crucial for the reliability of data. The National Heart, Lung and Blood institute in the Growth and Health study (NHLBI 1989) used two instruments to estimate energy expenditure from aerobic physical activities. The first instrument was a simplified pictorial three day diary, adapted from Baranowski et al (1984) depicting 24 physical activities commonly performed by children. The participants checked off the amount of daily time spent in various activities in 15 minutes intervals: <15 minutes, 15-30 minutes, or > 30 minutes. A score was derived from the girls responses taking into account the intensity level and duration of the activities they reported. The second index was derived from a physical activity pattern questionnaire adapted from Ku et al (1981) which asked about usual activities both in and out of school, during the school year and during the summer. An overall physical-activity-pattern score was derived from the questionnaire. The two measures of physical activity used in this study were significantly correlated (Spearman $r=0.17$, $p<0.0001$) However the authors were not satisfied with the level of correlation between the two methods because the median level of physical activity measured in the two ways were not fully consistent with each other. The activity level was higher in whites when measured by activity-pattern questionnaires but not different when measured by the diary. The authors suggest that the diary records were better able to capture less formal type 'play' activities (Obrazanek et al 1994).

Considering children's limited ability to estimate the time they spend on various activities and the possible differences in categorisation of activities by children, activity records could provide more accurate information about children's activity level than the activity-frequency/duration questionnaires. But record keeping is tedious for children and grouping of activities and calculation of time spent in various activities is more time consuming for the researcher as compared to the activity pattern questionnaires. Probably this is the reason that activity records are not used extensively for the estimation of physical activity level. But on the other hand weighed food records which are comparatively more difficult than keeping activity records are used more frequently. While scores of computer software programmes are available for analysing food records, for energy and other nutrient intakes, no software are available for estimating energy expenditure from activity records. But the growing evidence that the changes in physical activity are implicated in increasing prevalence of obesity and non communicable diseases indicates the need for more research in this field. Particularly for cross cultural studies activity records are likely to give a more accurate picture than an activity frequency checklist.

Because of the reasons mentioned above, three day activity records were used in this study to assess the physical activity level of children. Other methods which could provide a more accurate picture of total energy expenditure like direct calorimetry or the use of a pedometer was not feasible because of the sample size, resources available and variability in socio-cultural background of subjects. Furthermore both energy expenditure and activity patterns were of interest and the latter information could not be provided by direct calorimetry. So the information from activity records was used to calculate time spent in various activities grouped according to physical activity ratios and the factorial method was used to assess energy expenditure. Children were also compared in terms of time spent in various activities on week days and week ends as calculated from their activity records.

Since experts in physical activity have typically recommended the use of more than one method of assessment (Bar-Or 1989), questions about participation in various activities were also included in the students questionnaires. They provided an overview, served the purpose of estimating differences in general activity patterns and were helpful when children failed to keep three day activity records.

2.1.3 Anthropometric measurements

Anthropometric measurements are widely used for measuring growth and nutritional status of children.

Measurement of height and weight provides a convenient method of assessing growth. Height for age, weight for age and weight for height are three parameters commonly used for estimating growth and nutritional status for children. Although there are disagreements among experts about their applicability to the less developed nations, in practice the 50th centile of National Centre of Health Statistics (NCHS) values (collected from US children between birth and 18 years) are widely used as a 'reference'. On the premise that in India and many parts of Africa, South and Central America, where the growth patterns of non infected, well fed children have been studied, they are similar to the NCHS data, Garrow and James (1994) support the use of these reference values.

Some anthropometric measurements like measurement of skinfold thickness provide good estimates of general and localised fatness. But they are intrusive and time consuming and would have been particularly difficult from a practical point of view in Pakistan since it would have been necessary to undress and no separate rooms were available for taking measurements.

Body mass index, derived by dividing the body weight in kilograms by height in centimetres squared [BMI=wt(kg)/ht(cms)^2] is extensively used to assess overweight and obesity in adults. BMI is also accepted as a valid tool for assessing overweight and obesity in children (Rolland-Cachera et al 1991). Comparisons of means between groups within a narrow age range appear to be valid and the cut off points used for adults are not considered to be misleading (Hackett et al 1997).

In adults, ratio of waist circumference to hip circumference (WHR) is frequently used to assess abdominal fatness. However in children some problems regarding its use to assess abdominal obesity have been identified. Weststrate et al (1989) have argued that the negative correlation between age and WHR, combined with the fact that among children, WHR is more closely related to hip than waist circumference, suggests that it is a poor index of abdominal fatness in children. However, significant correlation between children's WHR and skinfolds have been identified in several studies of children (Weststrate et al 1989, Gillum 1987, Zonderland et al 1990) and a number of authors have tentatively concluded that in the absence of any other measures, WHR could still offer a useful index of abdominal adiposity (Zonderland et al 1990).

In this study NCHS reference values (WHO 1983) were used because the main aim was to compare the various groups. But these references could not be used to assess overweight in all the children due to the fact that these reference values are available for up to 145 cms tall boys and 124cms tall girls and in our sample all the girls and majority of boys were taller than this. So BMI was used for this purpose. WHR was considered acceptable for assessing fatness because it was a practical and convenient method and because of the narrow age range in our sample the confounding effect of age was expected to be low.

2.1.4 Biochemical characteristics.

In the present study the aim was to focus on differences in dietary and exercise habits with an overview of other CHD risk related differences rather than focusing on any particular physical or biochemical risks. As the number of participants from various sub-groups needed to be large enough to make comparisons and some of the subgroups are not familiar with the idea of research, it was crucial that data collection techniques were acceptable to all the groups.

Furthermore, any tests requiring laboratory analysis were not considered to be feasible because of differences in the study areas. Transporting blood samples from one country to another was not feasible and analysis of blood samples in two countries separately poses problems of standardisation of procedures. The use of portable kits served the study purposes best as the results were not likely to be confounded by laboratory techniques and secondly they were more economical and thus made testing a large number of children possible. As the use of Accutrend kits required skin pricks only, a higher participation rate was expected as compared to venepuncture. Two areas of risk were of particular interest ; diabetic tendency and blood lipids.

Fasting Plasma insulin levels and glucose tolerance tests have been used in obese children and adolescents to assess the diabetic tendency (Zannoli et al 1993, Shaukat & de Bono 1994). Another possible method of assessing diabetic tendency is to study fasting blood glucose levels. Various blood lipid and coagulant fractions could be tested for assessing biochemical indicators of CHD risk. Total blood cholesterol is one of the simplest of these and is often used for screening.

So in view of these requirements only fasting blood glucose and total blood cholesterol was measured using the Accutrend GC portable kit by Boehringer Mannheim. Another similar kit by Boehringer (Lipotrend) has been found to give reasonably reliable results. Correlation between laboratory analysis results and Lipotrend results was high (r=0.89) (Taylor et al, 1993).

2.1.5 Behavioural characteristics

There are numerous methods of data collection in social research from lengthy interviews, to impersonal mailed questionnaires. Interviews have an advantage of being flexible but are fraught with possibilities of bias and are more costly in terms of time and money than questionnaires. Mailed questionnaires are cheap, but need to be very simple and usually produce very poor response rates.

The self administered questionnaire is usually presented to the respondent by an interviewer or someone in an official position, such as a teacher. The purpose of the enquiry is explained and then the respondent is left alone to complete the questionnaires which may be sent in or collected later. This method of data collection ensures a high response rate, accurate sampling and a minimum of interviewer bias, while permitting interviewer assessments, providing necessary explanations and giving the benefit of a degree of personal contact. However the greatest care is needed in briefing such persons or they may, with the best intentions, introduce fatal biases.

The group-administered questionnaire is also largely self-explanatory and is given to groups of respondents assembled together, such as schoolchildren or invited audiences. Depending on the size of the group and its level of literacy two or more persons can see to the administration of the questionnaires, give help where needed (in a non-directive way), check finished questionnaires for completeness and so on. Sometimes variations in procedures may be introduced. For instance, a group of numbered questionnaires might be read aloud, one at a time, while the respondents write their answers in the booklets next to the question numbers. This ensures that all respondents answer the questions in the same order and that they all have the same amount of time to do so. A group of forty can be readily controlled in this way, but contamination (through copying, talking or asking questions) is a constant danger (Oppenheim 1992).

Getting information about health related behaviour and characteristics of children and parents was one aspect of this study and obtaining this information through questionnaires seemed most appropriate to the study design. Group administered questionnaires were used to obtain information from children and mailed questionnaires (hand delivered through children to their parents) were used to obtain information from parents.

Student questionnaires were administered by the researcher in the presence of relevant class teachers, in small groups of 20 or less students, with seating arranged to avoid contamination. Questionnaires were sent to parents at the very initial stage of the study and they were to be returned through children to get a high response rate.

2.2 *Methods and Procedures Used For Data Collection*

2.2.1 Sampling

- ***Selection of study area and schools***

In UK, the initial invitations (appendix 2) for participation in the study were sent to head teachers at 46 schools in different boroughs of London (and around London) and Oxford, where census data indicated large South Asian populations. Respondents were requested to indicate on the reply form whether a) they would be willing to take part in the study; b) it would be possible to recruit both Pakistani and British Caucasian participants from their school and if they were willing to participate, when this would be convenient. As a result of this enquiry Slough was selected for the study because of the high concentration of South Asians (Pakistanis) and the possibility of getting British Caucasian participants. In addition most of the middle schools in the town were willing to participate in the study. As it was intended to recruit children from school curriculum year 6 and 7 so as to get a sample of 10-12 year old boys and girls, it was also more convenient to carry out the study in coeducational middle schools rather than separate primary and secondary schools. Out of the total of seven coeducational, middle schools in Slough six showed interest in participation. The school from which a positive reply was received first was selected for the pilot study. From the remaining five the three schools which were able to participate at one time were recruited for the main study

In Pakistan the subjects were recruited from the province of Punjab because the majority (more than 90%) of the Pakistani immigrants in Slough come from that area. Six urban (from Lahore) and one rural school (from Kala-Shah-Kaku) were recruited through personal contacts and invitation through letters. From the urban area two groups of schools representing high income (2 schools) and relatively low income groups (four schools) were selected. Information about this aspect of the schools was obtained from the Association of Private Schools, (Punjab) and from the District Education Authority. All the schools from the urban area were single sex schools. Both the schools representing high income, (one for girls and the other for boys) were privately run by the same educational society. Two of the schools representing lower income, (one for boys and one for girls) were privately run by the same educational society (but not the one which ran upper class schools). One boys and one girls school representing the less affluent group were separate government schools.

The rural area school was a coeducational school having classes on separate floors of the building for boys and girls.

All the private schools in the sample had primary (curriculum year 1-5; typical age range, 5-9) year as well as secondary sections (curriculum year 6-10; typical age range, 10-14), while the two government schools were secondary schools.

- ***Recruitment of subjects***

It was intended to collect data from children old enough to have sufficient literacy skills to participate in the study but not too old to have acquired adult eating habits. Studies indicate early consolidation of health related behaviour and there are suggestions by researchers that interventions should begin in children younger than 11 years (Kelder et al 1994). Children around eleven years of age (10-12 years old) were considered to be best suited to the aims of this study. Older children were excluded from the study to prevent the results (physical and biochemical measurements) from being confounded by the effects of puberty. Findings regarding prevalence of risk factors and dietary and activity in this age group are likely to provide valuable information regarding prevention of CHD in future adult populations.

In UK all year six and seven students (in order to get 10-12 year old participants) were offered the opportunity to participate in the study. After having discussions with head teachers and the relevant class teachers, an initial talk about the study was arranged with the children, in which the procedure for blood testing was also demonstrated. At the end of the talk invitation letters to parents and consent forms for participation in the study were distributed. The willingness of parents as well as the child were essential to participate in the study. Only the children who returned signed consent forms were allowed to participate. Withdrawal from all or any aspect of the study at any time were permitted.

In Pakistan all the ten to twelve year old students within each school were invited to take part in the study. Because of the flexibility in age structure of classes, though the majority of them were in year six or seven, but not all the year six and seven children were in this age group. Particularly in the rural area selection was based on reported age rather than curriculum year. In urban areas age structure was relatively less flexible and classes which had highest number of 10-12 year olds were selected from each school, depending on the convenience of schools.

2.2.2 Pretesting of research tools

- *Pre pilot pre-testing*

In order to establish the feasibility of the methodology and acceptability of the proposed anthropometric and blood tests, it was intended to carry out a pilot study during July 1994. Ealing Education Authority was contacted and requested to provide addresses of schools in their borough, where Pakistani children might be in the majority. The authority was unable to provide any specific ethnic information; they gave addresses of seven secondary schools in that borough. Letters introducing the study and inviting the school to take part in the study were sent to all the seven schools.

Six of them showed interest in the study. Out of those six, two did not have either enough Asian or Caucasian students, two schools could not participate in the month of July and the other two decided not to take part in the study, primarily due to concern about the blood test.

After these initial attempts to carry out pilot testing of the questionnaire and diary in Ealing were unsuccessful and since it was apparent that a much higher concentration of Pakistanis could be found in the outskirts of London, it was decided to move the study to Slough. As the school holidays had started, addresses of three play centres in slough were obtained from Slough Borough Council after informing them briefly about the purpose of the study and procedures involved. As a result a small sample of 12 Pakistani and 8 Caucasian 12-13 year old boys was contacted.

As the Slough Borough Council had informed the senior play leaders in the play centres, they were quite supportive, but the children found keeping the three day record during the holidays was too much work and out of twenty, only four returned completed diaries. However all of them filled the questionnaires and three returned the parent's questionnaire. Height, weight and waist and hip measurements were taken for all of them and two were willing to have the blood test taken.

On the basis of this pre-testing, the general and cardiovascular knowledge questionnaires were modified and size and format of the diary altered to make it more user friendly.

The protocol of the study was presented to the ethical committee of King's College London. After further explanation of the blood testing procedure and assurances that the subjects would be able to withdraw from the study at any point, the protocol was approved.

- ***The Pilot Study***

In Sept-Oct.94 a pilot study (for details see appendix 3) was conducted in one co-educational school in Slough to test the revised research tools: diaries and questionnaires and blood testing and anthropometric procedures.

Out of a total of 175 students enrolled in year six and seven, 62 girls and 52 boys volunteered to take part in the study. Nearly 50 % of them were Indians, 40 % Pakistanis and 10 % Caucasian. All of them returned consent forms signed by their parents and most of them (102, 90%) also gave signed consent for the blood test.

Anthropometric measurements were taken on all children. The blood test was carried out on 93 children. Most (169) of the participants completed student questionnaires; diaries were returned by 78 children but of these 49 were good enough for analysis. Parents' questionnaires were returned by only 62 children At the end there were 31 cases for whom all the information was available.

Although research procedures individually were found to be satisfactory (only a few changes were required in the student and parent questionnaires), certain changes were made in the order of completing various parts of the study and methods of explaining the procedure of keeping food and activity records so that response rate could be improved. In the pilot study questionnaires were sent to parents at a later date after receiving signed consent forms. In the main study the parents questionnaires were sent to parents with the invitation to take part in the study and consent forms; so if they were willing to participate they returned both the consent forms and the completed parent's questionnaires together. Overhead transparencies of blank and example pages of the diary were used to explain the record keeping process. Samples of utensils, food and packaging were shown to students to help them estimate food intake.

2.2.3 Procedure for completing various parts of the study (Main study)

The following procedure was used for the completion of various parts of data collection in each school:

1. A talk was given to the children to introduce them to the background of the study and offer them the opportunity to take part. The blood testing procedure was demonstrated and letters (appendix 4a) and consent forms (appendix 4b) for parents along with parents' questionnaires were distributed.

2. In a second meeting with only the children who agreed to participate, the method of keeping the records was explained and diaries were distributed. The school was visited by the researcher during the lunch time the next day to answer any queries about the diaries (in UK only because in Pakistan children do not have their mid-day meal in school).

3. Anthropometric measurements were taken on any working day according to the convenience of the school after the record keeping was completed. In most cases, blood testing and anthropometry were done on the same day.

4. Letters indicating the date and time of blood testing along with a fasting status confirmation sheet were sent to parents two to three days prior to the test. The fasting status confirmation sheet was to be brought back, signed by parents, on the blood testing day.

5. The blood test was done first thing in the morning, on any working day according to the convenience of the school. Breakfast was provided after the test. In the UK, school dinner ladies helped in providing breakfast in dining rooms. In Pakistan fruit juice cartons and sandwiches or biscuits were purchased and handed to the child after the blood test.

6. Questionnaires were distributed to students in their class rooms in the presence of their teachers; questions were read out by the researcher for the whole group; the subjects marked/wrote the answers simultaneously and the completed questionnaires were collected on the spot. Extra time and assistance was given to children who had not finished the questionnaires. The time and day of completing questionnaires was set according to the convenience of the school but so as to be after the record keeping period and not on the same day on which blood testing was done.

   Letters indicating the need to consult their GP were sent to any parents whose child had TBC above 5.9 mmol/l. Similar letters would have been sent to children having FBG above 7 mmol/ but none of the children needed them.

- ***Anthropometric measurements:***

Height

Height was measured with a portable stadiometer. Subjects were asked to remove their shoes, the stadiometer was held on the flat surface and then the subject was asked to stand on the metallic plate. Subjects were directed to stand in a way so that their heels were touching the back of the plate and the tape was in the middle. As it is generally known that the erect height of a person declines as the day progresses and the measurement of the maximum height clearly requires some stretch of the spine as well as general correct posture, subjects were also asked to stand straight and as tall as they could without lifting their heels. The position of the tape was checked, (head kept in Frankfort plane) and height was noted.

Waist and hip circumference

For waist and hip measurements, subjects were asked to stand straight with feet together and head up (because they always tend to look down when the measurement was being taken).

For the waist circumference they were asked to pull up their shirts or blouses and hold it up with their left hand while they were being measured. Waist circumference was measured by holding the fabric measuring tape snugly around the waist at the midpoint between the bottom rib and tip of hip bone.

Hip circumference was measured at the fullest part of the hips with trousers or skirts on.

- ***Blood test***

Pre-preparation of the subjects for the blood test

When the child came into the bleeding room, the fasting status confirmation sheet, signed by parents was received and he/she was also asked whether he/she had eaten or drank anything that morning. If they indicated eating or drinking anything except water they were excluded from the test.

Skin Prick

The Autoclix tool by Boehringer Mannheim was used for the finger skin prick. It can work with white, yellow or orange pressure platforms which are suitable for soft, average and hard skins respectively. White (soft) pressure platforms were used in this study. The lancets which are used with this tool are completely covered with plastic. The plunger is pressed for inserting the lancet and the tip of the needle is uncovered by twisting off the plastic cap during insertion into the autoclix. As soon as the plunger is released the whole lancet goes inside the Autoclix.

Children were asked to warm up their hands by exercising them so that blood flow was normal. The first finger of the left hand was selected for pricking, unless the child wanted the other hand or another finger.

The following procedure was used for pricking the finger

1. Fresh pair of gloves were worn:

2. Finger was cleaned with mediswab;
3. New lancet (and fresh pressure platform) was inserted in the Autoclix, showing the child that "it's the new needle for you"
4. Glucose strip was inserted into the Accutrend GC meter
5. And when the meter was ready skin prick was performed.

After the test children were given boiled sweets to eat and were asked to stay in the room for a few minutes to check that were not feeling dizzy or weak. If they were not feeling well they stayed in the room and were offered food and were allowed to leave the room only when they were very confident that they were feeling OK.

- ***Three day food and activity record***

The Diary

The diary (appendix 5) had food record and activity record sections. At the beginning of each section brief instructions for keeping the records were given.

The records were to be kept for two weekdays (Thursday and Friday in UK and Wednesday and Thursday in Pakistan) and one weekend day (either Saturday or Sunday in UK and Friday in Pakistan). (in Pakistan, in both the urban and the rural study areas children had only one weekly holiday on Friday). In UK half of the children kept records for Sunday and half for Saturday. On the instructions page of the diary, it was indicated whether the record was to be kept for Saturday or Sunday.

- ***Food records***

On each occasion that food or drink was eaten the time, description of food eaten, amount eaten, where eaten and with whom was noted on the food records. The amount was written in household measures or in grams and mls if known.

Children were instructed to measure the size and/or volume of the glass, cup, bowl, plates and spoon they normally used. A 30ml plastic measuring cup graduated in mls was given to each child and the procedure for measuring the volume was demonstrated in each class separately.

Actual cartons and packets of juices and crisps and biscuits of varying sizes and types were shown to clarify the importance of detailed records and to show how they could estimate the amount they had eaten from looking at the label.

- ***Activity record***

The activity record blank for each day was subdivided into fifteen minute periods. The purpose and method of keeping the activity record was explained to the children and the type of details required were clarified.

- ***Questionnaires***

Parents' Questionnaire

A short questionnaire was sent to parents (appendix 6) to obtain information about family size and composition, family disease history, parental attitudes about children's diet and parents perceived differences in their own and their children's diet and activities.

Students' Questionnaire

All the participating students completed a questionnaire (appendix 7) about their food preferences, health attitudes and cardiovascular nutrition knowledge.
The cardiovascular nutrition knowledge questionnaire was based on two nutrition teaching packages for primary schoolchildren in Berkshire (HEU, Berkshire 1991) and cardiovascular nutrition knowledge questionnaire designed by White et al (1992).

2.2.4 Modification of research methods for the study in Pakistan

For use in Pakistan all the letters, forms, questionnaires and diaries were translated into Urdu. In the cardiovascular nutrition knowledge questions, the foods which were unknown to Pakistani children were replaced by equivalent Pakistani foods. Similar changes were made in the food frequency questions to facilitate understanding of the question by the students.
A pilot study was conducted in Pakistan to assess the effectiveness of the methods and some changes in wording of questions were made accordingly.

The translation of research tools was done under the guidance of an experienced Pakistani nutritionist, Dr Salma Badruddin, Senior Officer at Agha Khan Medical University Karachi.

For the period of data collection in Pakistan the researcher was enrolled as an external student at Agha Khan Medical University, Karachi. The research supervisor in UK, Miss Jane Thomas visited the study area in Pakistan during the data collection.

2.3 Data Collection and Analysis

2.3.1 Data collection

Data was collected in the UK between October and November 1994

Data was collected from Pakistan in the months of April-May 1995

2.3.2 Food records

For estimating nutrient intake the food records were entered and analysed on the nutritional analysis package COMP-EAT with added database incorporating compositional data of South Asian dishes from Kassam-Khamis (1996). The food records were also entered and grouped on SPSS for windows, (version 6) for comparison of eating habits.

2.3.3 Activity records:

Activity records were analysed on SPSS for windows, (version 6) for the frequency of various activities and energy expenditure per day was calculated using the PAL (see appendix 8).

2.3.4 Questionnaires:

Information from both parents' and childrens' questionnaires was coded and entered on SPSS for analysis.

2.3.5 Overall analysis:

Information obtained from the diaries: nutrient intake, food consumption and meal patterns; energy expenditure and average time spent in various activities per day, were also entered in the same file on SPSS that had information from the questionnaires for the final analysis.

For the comparison of group means in the case of continuous numeric variables, one way analysis of variance was used. For the comparison of proportions the chi square test was used. All the statistical comparisons were done twice, once between the 3 groups of the children in the UK, British Pakistani, British Caucasian and British Indian; and once between the four groups of Pakistani children: rural, affluent and less affluent in Pakistan and British Pakistani in UK.

With regards to anthropometry and blood biochemistry, wherever reference studies were available standard cut off points or those which have been used by other researchers in similar instances were used. For instance, for cholesterol the cut off points indicating need for dietary guidance and intervention which have been used by Badruddin et al 1993, also were used. For BMI, cut off points suggested for adults were used because for the majority of children in our sample NCHS weight for height standards could not be used. For girls more than 120 cm tall and boys more than 145 cm tall, NCHS data does not provide any reference values for weight for height. For fasting blood glucose no reference information was available, so children were grouped into tertiles for inter group comparison (chapter 3). For intra group comparison (chapter 7) children were categorised into tertiles according to within group values.

3. CHARACTERISTICS OF RESPONDENTS AND THEIR FAMILIES

3.1 Sample Size

In all, 748 children, 10-12 year old boys and girls participated in this study (participation by group and sex is presented in table 3.1). In UK 257 children (140 girls and 117 boys) and in Pakistan 491 children (210 girls and 281 boys) participated in the study but not everyone completed every aspect of the study (table 3-1). Details of the response rate for various aspects of the study are presented in table 3.2.

Table 3-1: Number and Percentage Of Boys And Girls Who Participated in The Study

		GROUP							
		Pakistani Sample				British Sample			
	Total	RrP	LaP	AfP	Total	BrP	BrC	BrI	Total
	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %
Girls	350 47%	59 43%	67 39%	84 46%	210 42 %	73 54%	21 54%	46 56%	140 54%
Boys	398 53%	79 57 %	105 61%	97 54%	281 58 %	63 46 %	18 46%	36 44%	117 46%
Total	748 100%	138 100%	172 100%	181 100%	491 100%	136 100%	39 100%	82 100%	257 100 %

RrP=rural Pakistani, LaP=less affluent Pakistani, AfP=affluent Pakistani, BrP= British Pakistani, BrC=British Caucasian, BrI=British Indian

Table 3-2: Response Rate for Various Aspects Of The Study

		GROUP							
		Pakistani Sample				British Sample			
		RrP	LaP	AfP	Total	BrP	BrC	BrI	Total
	Total	%	%	%	no.	%	%	%	no.
	748	n–138	n=172	n 181	n–491	n–136	n=39	n–82	n=257
Student's Questionnaire	675(90%)	94%	98%	83%	454	83%	87%	89%	221
Parents' Questionnaire	541(72%)	58%	71%	56%	302	91%	89%	97%	239
Anthropometry	593(79%)	62%	77%	90%	368	86%	87%	90%	225
Blood Test	477(64%)	43%	57%	73%	277	75%	87%	76%	200
Food & Activity Records	382(51%)	35%	33%	505	189	77%	74%	70%	193
All Five	281(38%)	26%	29%	38%	150	49%	54%	52%	131

3.2 Demographic Characteristics Of The Children's Families

3.2.1 Family size

Among the British groups the mean number of family members was highest for the British Pakistani families (6.3 BrP vs 4.7 BrC & 4.8 BrI). Among the Pakistani families in Pakistan the mean number of family members was highest for the rural group if only parents and children were included and if all the members including grand parents, uncle aunts etc. living in the same household were included, the rural and the urban affluent had higher mean number of family members (6.4 each) than the less affluent urban families (6.0) (see table 3-3).

3.2.2 Parents' age

British Caucasian parents tended to be somewhat younger than British Pakistani or British Indian parents, But British Pakistani fathers were younger than any group of fathers in Pakistan, among whom the urban fathers tended to be older than the rural ones (see table 3-3).

Table 3-3: Family Size And Age Of Parents

		p (UK3)	p (PK4)	GROUP					
				RrP	LaP	AfP	BrP	BrC	BrI
				n=66	n=118	n=55	n=88	n=32	n=66
Family Size (parents and children only)	Mean	****	ns	5.98	5.77	6.14	6.24	4.69	4.67
	Max.			10.00	10.00	10.00	10.0	8.00	7.00
	Min			3.00	3.00	3.00	3.00	2.00	2.00
Family Size (including others)	Mean	****	ns	6.38	5.97	6.44	6.31	4.69	4.75
	Max.			14	12	11	10	8	7
	Min			4	3	3.00	3	2	2.00
Father's age	Mean	ns	ns	44.24	44.57	42.39	40.5	38.1	41.2
	Max.			68	60	60	65	60	67
	Min			32	31	28.00	30	27	31.0
Mother's age	Mean	ns	ns	37.56	37 42	36.11	36	34.9	37.1
	Max.			60	50	55	58	50	54
	Min			30	25	25.00	24	26	26.0

**** =P<0.00005

3.2.3 Length of stay and country of birth of British Pakistani and British Indian parents in UK

Although a majority of both British Pakistani and British Indian parents were born in Pakistan and India respectively, a slightly higher proportion of British Indian parents were born in UK than British Pakistani parents (see table 3-4).

None of the Pakistani fathers and only 1% of Indian fathers were born in UK. Whereas 3% of Pakistani mothers and 8% of Indian mothers were born in UK. In calculating mean length of stay in UK parents born in UK were excluded.

Both Indian mothers and fathers had on average come to the UK 20 years ago, whereas among Pakistani parents fathers (mean length of stay 22 years) had been in UK significantly longer than Pakistani mothers (17 years) (see table 3-5).

Table 3-4: Country of Birth of Parents in the UK

Country of Birth	GROUP					
	FATHERS			MOTHERS		
	BrP	BrC	BrI	BrP	BrC	BrI
	%	%	%	%	%	%
	n=124	n=35	n=80	n=88	n=32	n=66
Pakistan	90	0	3	93	0	3
UK	0	80	1	3	88	8
India	4	0	78	2	0	69
other	6	20	18	3	12	20

Table 3-5: Length of stay in UK (in years) of British South Asian parents

Length of stay		p value	GROUP	
			BrP	BrI
			n=115	n=76
Fathers	Mean	*	22	20
	Max.		40	33
	Min		4	5
Mothers	Mean	****	17	20
	Max.		44	34
	Min		1	5

* = P<0.05, **** =P<0.00005

3.2.4 Parents' education

In the UK sample Pakistani parents seemed to be less educated than the Caucasian or Indian parents. The percentage of fathers who had '10-12' years of formal education, was similar in the three UK groups but the proportion of fathers having none or very little education was higher among the British Pakistani group (35%BP vs 18% BC & 9% BI); and the proportion having graduate or post graduate qualifications was lower than the other two groups (13% BP, 64% BC & 33% BI). Nearly half (46%) of Pakistani mothers were uneducated as compared to 14% British Caucasian and 12% British Indian mothers who were uneducated. The percentage of mothers who had completed 10-12 years of formal education, or had higher educational qualification was lower among the British Pakistani group as compared to the other two British groups.

Within the three groups in Pakistan, as would be expected, the affluent urban parents were most educated and the rural parents were least educated. Both the urban groups of parents were more educated than the British Pakistani parents. British Pakistani parents were however more educated than the rural Pakistani parents (see table 3-6).

Table 3-6: Educational Level of Parents

Educational Level	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
FATHERS' EDUCATION.	*	****	n=49	n=108	n=63	n=53	n=17	n=45
none/v.little			52	14	0	36	18	8
10-12 yrs of formal education			38	59	31	43	47	44
graduate/post gr.			10	27	69	21	35	47
MOTHERS' EDUCATION.	**	****	n=51	n=100	n=53	n=48	n=14	n=43
none/v.little			89	28	12	46	14	12
10-12 yrs of formal education			9	67	55	42	64	56
graduate/post graduate			2	5	33	13	21	33

*=p<0.05, **=p<0.005, ****=p<0.00005

3.2.5 Parents' religion

All of the Pakistani and British Pakistani parents were Muslims. The majority (96%) of British Caucasian parents were Christian. Seventy nine percent of British Indian parents were Sikh and 21% were Hindus.

3.2.6 Parents' occupation

For the UK groups families were categorised into socio-economic groups according to the Registrar Generals Classification of Occupations. According to this grouping the percentage of fathers belonging to social class II was highest among the British Caucasian (20%), followed by British Indian (10%) and least among British Pakistani (8%). Pakistani fathers were most often unemployed (27%BP vs 9% BC & 10% British Indian). A similar trend was also apparent in relation to mother's occupations. Eighty one percent of British Pakistani mothers were not doing any paid work, as compared to 44% British Caucasian and 29% British Indian mothers.

In Pakistan as the schools were selected on the basis of the socio-economic background of the area, the proportion of fathers and mothers belonging to more prosperous occupations was highest in the affluent urban group and lowest in the rural group. The proportion of farmers in the rural sample was not as high as would be expected in a typical rural area of Pakistan for two reasons. Firstly because the area was adjacent to a big city and had factories nearby, this increased the relative proportion of manual workers and labourers in this particular rural area. Secondly because only those children who were attending school participated in the study and their fathers were more likely to be semi-skilled or skilled workers than farmers.

It is interesting to note that British Pakistani mothers (81%) had a very similar rate of being housewives as did rural or less affluent Pakistani mothers (85% & 87 % respectively). Among the affluent urban Pakistani group only 66 percent of mothers had no occupation other than housewife (see table 3-7).

Table 3-7: Social Class of British Parents

Social Class	FATHERS			MOTHERS		
	BrP	BrC	BrI	BrP	BrC	BrI
	%	%	%	%	%	%
	n=124	n=35	n=80	n=88	n=32	n=66
No information given	27	29	18	0	0	0
SCII	8	20	10	2	6	9
SCIII	30	29	43	9	31	42
SCIV	8	14	20	8	19	20
Unempl/H.Wife	27	8	9	81	44	29

Table 3-8: Occupation of Parents (Pakistan Sample)

OCCUPATION	GROUP					
	RrP		LaP		AfP	
	Father	Mother	Father	Mother	Father	Mother
	%	%	%	%	%	%
	n=56	n=40	n=99	n=61	n=49	n=35
Professional	5	0	6	3	10	9
Business	7	0	42	3	39	6
Service	61	8	39	3	43	17
Manual	25	8	11	3	8	0
Student	0	0	0	0	0	3
None/Housewife	2	85	1	87	0	66

3.2.7 Family disease history

According to evidence available from other studies (DoH 1996) the Pakistani and Indian children in UK were expected to have a higher rate of positive family history for heart disease and diabetes than Caucasian children.

According to the responses from parents this was not the case. Although the difference was not statistically significant British Caucasian children reported a family history for diabetes more often than British Pakistani and the British Indian children (31% BC vs 20% BP & 27% British Indian). In the case of heart disease the rate was significantly higher among the families of British Caucasian children as compared to British Indian or British Pakistani children (33% BC vs 13% BP & 12% BI). Between the two Asian groups British Indian families indicated having any family member with diabetes more often and with heart disease slightly less often than the British Pakistani families.

The differences in family disease history were significant between the four Pakistani groups. Parents of rural children reported a significantly lower rate of family history for either diabetes, heart disease or both diseases together, as compared to any of the urban Pakistani groups and the British Pakistani group. The less affluent urban children had the highest rate of positive family history for diabetes and heart disease (31&17%) as compared to affluent urban (11 & 11 %), rural (6 & 4%) groups in Pakistan or the British Pakistani children in UK (20 & 13%).

These results indicate a similarity in trend of increase in CHD and diabetes from rural to urban Pakistani and from rural to British Pakistani group.

Table 3-9: Family History Of Diabetes Or Heart Disease

DISEASE	GROUP							
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	Col	Col	Col	Col	Col	Col		
	%	%	%	%	%	%		
	n-62	n=99	n 55	n 109	n=35	n=69		
Diabetes							*	ns
0	94	70	90	79	69	73		
1	6	20	6	16	26	21		
2 or more	0	10	4	4	5	6		
Heart disease								
0	96	83	90	88	67	88		
1	3	10	7	10	18	11		
2 or more	1	7	3	2	14	0		
Both Diseases							**	ns
0	99	92	91	93	90	96		
1	0	7	8	7	8	2		
2 or more	1	1	1	0	2	2		

* = P<0.05, ** = P<0.005

- ***Relatives who had diabetes or heart disease***

One general trend which was similar in each of the six groups was that while the relatives who had diabetes were mostly grandmothers; the ones with heart disease were mostly grandfathers.

The percentages in this paragraph are based on the number of those children who had a positive family history for the relevant disease. Among the three UK groups the proportion of 2nd generation relatives (grandparents) who had heart disease or diabetes was higher (with varying degrees for the two diseases) and that of 1st generation relatives was lower among the British Caucasian families as compared to Indian and Pakistani families. Between the four Pakistani groups, less affluent urban Pakistani families had the highest proportion (53%) of 1st generation relatives who had diabetes (not statistically significant) (see fig 3-1 and 3-2).

These results indicate that in this sample although the overall prevalence does not follow the 'expected' pattern there appears to be a pattern of South Asian adults developing these conditions at a younger age.

Figure 3-1: Reported Occurrence of Diabetes in 1st, 2nd or both generations of family members (based on children who had a positive family history for heart disease)

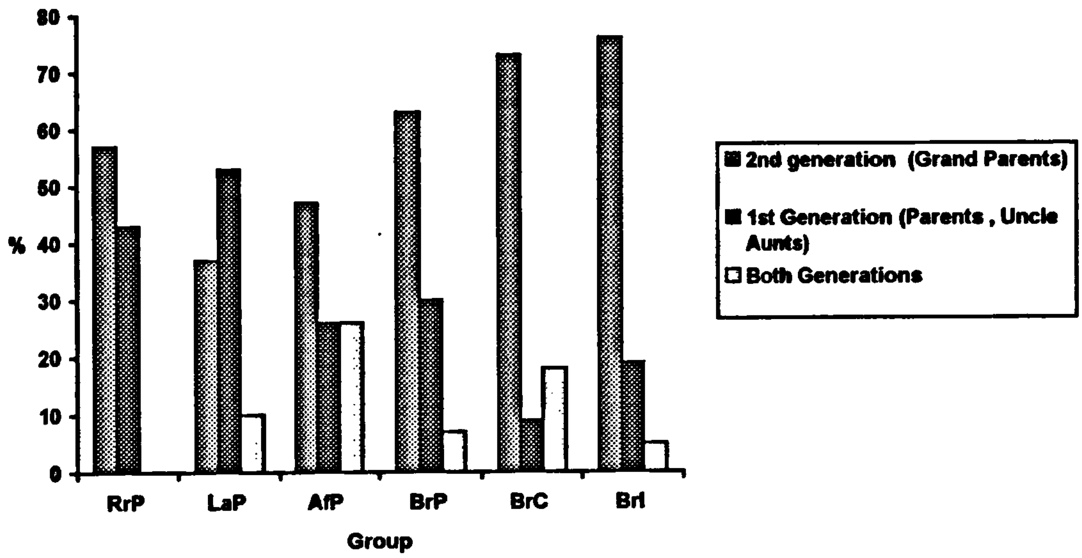
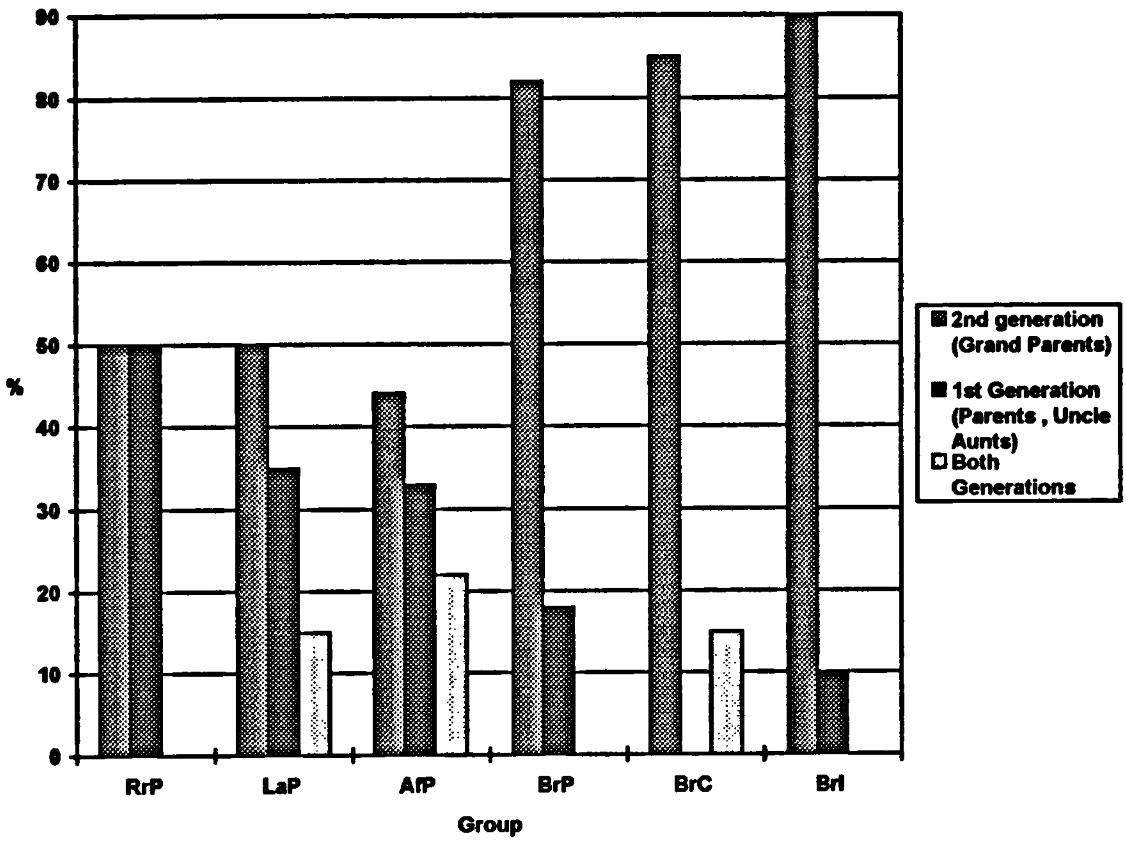


Figure 3-2: Reported Occurrence of CHD in 1st, 2nd or both generations of family members (based on children who had a positive family history for heart disease)



3.3 Physical Characteristics Of The Participating Children

3.3.1 Differences in growth and nutritional status

Children's height for age and weight for age and weight for height were compared with NCHS standards to study inter group differences in growth (mean, standard deviation, minimum and maximum values for various anthropometric indices are presented in table 3-10 & 3-11). The required information (age, sex, height and weight) was available for 419 children, but weight for height could be compared only for 96 boys because weight for height standards for children are available for up to 145 cms tall boys and 120 cms tall girls.

In the British sample the only significant difference was in weight for age percentile (WAP). Mean WAP British Pakistani children (51.29) was significantly lower than that of British Indian (64.71) or British Caucasian children (68.53).

Mean values for height for age {Z score (HAZ), percentile (HAP) and percentage of median (HAM)} and weight for age {Z score (WAZ), percentile (WAP) and percentage of median (WAM)}; were significantly lower for rural Pakistani boys and girls as compared to affluent and less affluent urban Pakistani or British Pakistani children. Affluent Pakistani boys and girls had the highest mean values of weight for age and height for age. British Pakistani boys were slightly shorter (HAZ = 0.28 BrP & 0.42 AfP) but heavier (WAZ= -0.17 AfP, & 0.11 BrP) than affluent urban Pakistani boys.

In the case of girls there was a steady increase in mean height for age and mean weight for age from rural to less affluent, affluent and British Pakistani group. In boys this trend was present for weight for age only. In the case of height for age, the mean increase was steady from rural to less affluent and affluent urban but not from affluent urban to the British Pakistani group. British Pakistani boys were in fact slightly shorter than affluent Pakistani boys.

The rate of stunting was calculated according to the cut off points used in another study in Pakistan (Badruddin et al, 1993). Children below the 10th percentile for 'height for age' were categorised as stunted. A significantly higher proportion of rural boys and girls (23%b, 52%g) were stunted as compared to affluent (0%b, 4%g) or less affluent urban

Pakistani boys and girls (10%b, 11%g). British Pakistani boys were closer to less affluent urban Pakistani boys and girls in the prevalence of stunting (7%b, 9%g). British Caucasian (0%b, 5%g) and British Indian (6%b, 0%g) children were less often stunted than British Pakistani children.

Boys having more than 5% above median weight for height were classified as overweight and those below 3rd centile for weight for height as wasted. None of the British Pakistani or British Caucasian and only 3% of British Indian boys were wasted according to this criteria. Wasting was noticed in 18% of rural, 14% of less affluent and 10% of affluent urban Pakistani boys. Interestingly overweight was less common in affluent Pakistani boys as compared to less affluent or rural Pakistani boys. British Pakistani boys were more often overweight than affluent Pakistani boys and were closer to less affluent Pakistani boys in this respect (figure 3-6).

Table 3-10: Anthropometric indices Of Growth - Boys According to Group

INDICES			GROUP					
	P (UK3)	P (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			n=21	n 29	n=31	n 51	n=14	n=33
HAZ	ns	****						
Mean			-0 89	-0.02	0.42	0.28	0.80	0.46
Maximum			0 46	2.84	2.03	2.32	3.45	2.86
Minimum			-3 13	-2.56	-1.10	-2.04	-1.15	-1.37
Std Dev			0 87	1.18	0.90	0.92	1.35	1.02
HAP	ns	****						
Mean			25 43	49.46	61.85	58.95	66.34	62.50
Maximum			67 57	99.77	97.87	98.97	99.80	99.79
Minimum			0 09	0.52	13.52	2.09	12.46	8.59
Std Dev			18 31	30.62	26.64	27.63	30.95	28.78
HAM	ns	****						
Mean			95.87	99.87	101.91	101.27	103.61	102.14
Maximum			102.02	113.28	109.44	110.91	115.38	113.42
Minimum			85.36	87.97	94.47	90.45	94.60	93.15
Std Dev			4.08	5.48	4.22	4.36	6.14	4.85
WAZ	ns	****						
Mean			-1.32	-0.41	-0.17	0.11	0.68	0.60
Maximum			0 17	2.74	3.41	2.75	2.44	3.87
Minimum			-2.49	-2.49	-1.85	-1.73	-0.93	-1.76
Std Dev			0.66	1.26	1.17	1.01	0.95	1.17
WAP	*	****						
Mean			13.18	38.74	41.79	51.29	68.53	64.71
Maximum			56 60	99.69	99.80	99.70	99.26	99.80
Minimum			0.64	0.64	3.24	4.20	17.56	3.88
Std Dev			12 55	33.48	28.37	27.82	26.35	29.48
WAM	*	***						
Mean			79.82	96.56	100.29	105.39	117.49	116.27
Maximum			103 88	163.88	184.13	164.07	156.95	190.55
Minimum			60.11	62.96	70.82	71.81	85.25	73.75
Std Dev			10 27	23.98	25.18	21.34	21.24	25.31
WHZ	ns	ns						
Mean			-0 97	-0.75	-0.54	-0.12	0.38	0.19
Maximum			3 35	2.69	3.18	1.96	1.09	1.79
Minimum			-2 42	-3.00	-2.64	-1.76	-0.44	-2.41
Std Dev			1 33	1.48	1.53	1.02	0.60	1.36
WHP	ns	ns						
Mean			21 35	30.91	34.71	46.59	63.31	55.86
Maximum			99 80	99.64	99.80	97.48	86.17	96.36
Minimum			0 77	0.14	0.42	3.95	33 02	0.79
Std Dev			28 01	34.73	33.48	30.73	21 10	37.59
WHM	ns	ns						
Mean			92 03	95.00	96.61	100.66	106.54	106.04
Maximum			138 35	143 15	152 87	130.76	117.55	127.37
Minimum			76 84	73.36	73.69	81.34	95 90	78.68
Std Dev			13 89	17.65	20 59	12 85	8 49	17.43

* = P<0.05,, ***=P<0.0005, **** = P<0.00005

Table 3-11: Anthropometric indices Of Growth-Girls According to Group

indices	P (UK3)	P (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			n=21	n=37	n 56	n-66	n=19	n-41
HAZ	ns	***						
Mean			-0.64	0.01	0.26	0.39	0.65	0.49
Maximum			2.65	2.54	2.22	2.40	4.06	2.96
Minimum			-3.34	-2.16	-2.69	-1.78	-1.55	-1.25
Std Dev			1.60	1.05	1.01	0.99	1.54	0.96
HAP	ns	***						
Mean			34.36	50.25	57.30	61.73	60.00	63.09
Maximum			99.59	99.44	98.69	99.19	99.80	99.80
Minimum			0.04	1.54	0.36	3.74	6.03	10.49
Std Dev			38.26	29.97	27.27	29.15	31.82	25.35
HAM	ns	***						
Mean			96.93	100.11	101.25	101.87	103.08	102.37
Maximum			113.05	112.11	110.98	111.86	119.40	114.61
Minimum			84.05	90.30	87.91	91.99	92.34	93.81
Std Dev			7.75	4.89	4.80	4.73	7.38	4.67
WAZ	ns	****						
Mean			-1.03	-0.52	-0.05	0.27	0.46	0.17
Maximum			0.77	1.47	3.90	3.22	2.57	2.49
Minimum			-2.75	-2.20	-2.74	-1.84	-1.41	-1.54
Std Dev			1.01	0.94	1.25	0.99	1.34	1.06
WAP	ns	****						
Mean			23.97	35.06	47.69	57.57	59.41	52.82
Maximum			78.08	92.95	99.80	99.80	99.49	99.36
Minimum			0.30	1.38	0.31	3.26	7.94	6.22
Std Dev			24.66	27.74	32.87	27.18	35.92	29.98
WAM	ns	****						
Mean			83.33	93.01	103.69	109.52	115.62	107.63
Maximum			120.45	138.85	199.71	182.67	167.84	165.29
Minimum			53.53	62.60	53.73	68.71	76.46	74.80
Std Dev			18.21	18.74	27.41	22.70	30.98	24.29

* = P<0.05, **= P<0.005, ***=P<0.0005, **** = P<0.00005

Figure 3-3: Percentage Of Wasted And Overweight Boys According To Group

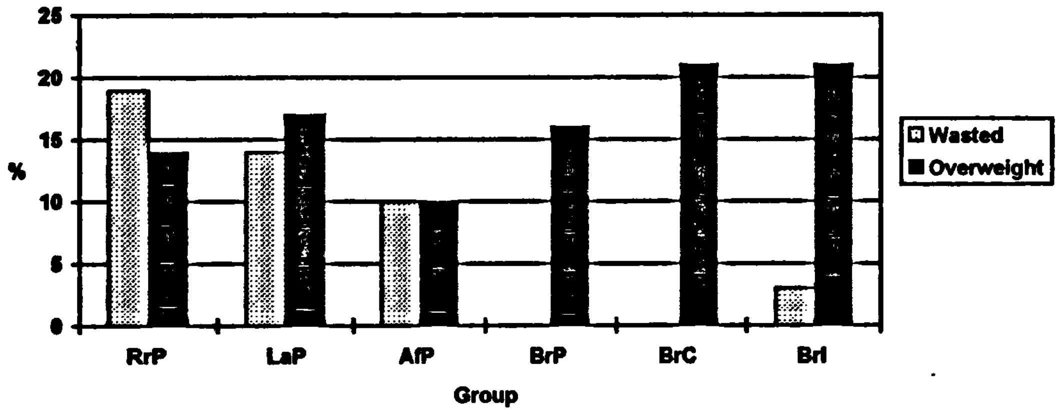
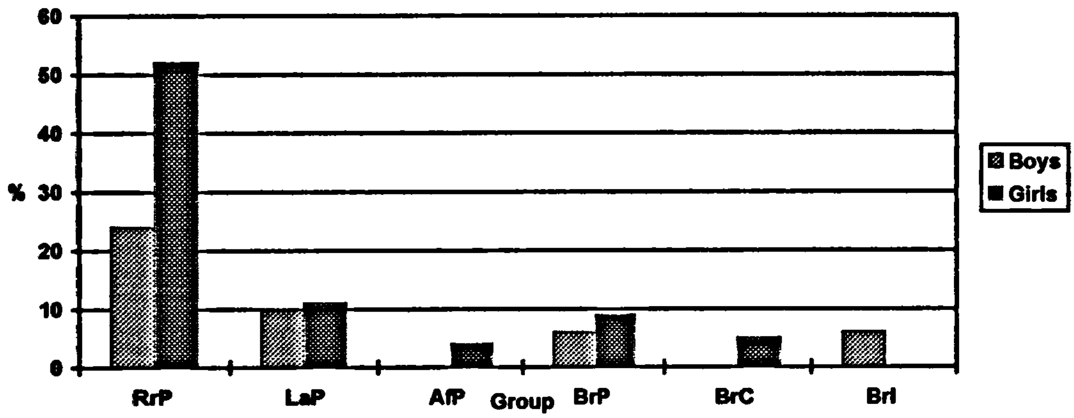


Figure 3-4: Percentage Of Stunted Girls And Boys According To Group



3.3.2 Differences in anthropometric and blood measurements

The three groups of children studied in UK were not significantly different from each other in terms of fasting blood glucose, total blood cholesterol, height, weight, body mass index, or waist-hip ratio. However when the two sexes were looked at separately, Pakistani girls had significantly higher waist-hip ratio than the Indian girls and Indian boys had significantly higher weight and body mass index than the Pakistani boys. Indian boys also had significantly higher mean fasting blood glucose than the British Caucasian boys.

There were more significant differences between the three groups of Pakistani children studied in Pakistan than the three groups of UK children. Differences in total blood cholesterol were not statistically significant but rural Pakistani children had significantly lower mean values for height, weight, waist-hip ratio, body mass index and fasting blood glucose than the affluent and less affluent urban children. The trend of differences remained the same even when the two sexes were studied separately. The differences between the affluent and less affluent urban groups were however not of a similar nature when the two sexes were studied separately. Less affluent girls and affluent boys had higher fasting blood glucose, whereas the waist-hip ratio was not significantly different between girls but it was between boys; the less affluent urban boys had significantly higher waist-hip ratio than the other two groups.

Mean values for Body Mass index were also highest for British Pakistani girls and boys as compared to Pakistani girls and boys. However among the girls there was a significant difference between British Pakistani and rural and less affluent urban Pakistanis, while among the boys the difference was only significant between British Pakistani and rural Pakistani groups.

The mean height and mean hip circumference of British Pakistani children was lower than that of affluent Pakistani children While British Pakistani girls had a significantly higher mean waist-hip ratio as compared to any group of Pakistani girls, British Pakistani boys had significantly higher waist-hip ratio than rural and less affluent Pakistani boys. Affluent Pakistani boys had a lower mean waist-hip ratio than British Pakistani boys but the difference was not statistically significant.

British Pakistani children (both boys and girls) had higher mean values for weight and waist circumference than the three Pakistani groups in Pakistan. The difference was statistically significant ($p<0.05$ in each case) between British Pakistani and rural and less affluent Pakistani children but not between British Pakistani and affluent Pakistani children.

British Pakistani girls and boys both had higher mean values for total blood cholesterol than any group of Pakistani girls and boys. While the difference was statistically significant between British Pakistani and each of the three groups of Pakistani children in the case of girls, among boys the difference was only significant between British Pakistani and rural and affluent Pakistanis ($p<0.05$ in each case). The mean fasting blood glucose was lower than Pakistani less affluent urban children (who had higher fasting blood glucose than affluent and rural group).

Table 3-12: Mean Anthropometric And Blood Measurements Of Boys From The Six Groups According To Group

Measurements	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			n=55	n=64	n=76	n=65	n=19	n=41
			Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
Age (in months)	ns	ns	136 *16*	135 *12*	138 *10*	136 *7*	136 *7*	136 *7*
Height (in cms)	ns	****	137 *8.73*	141 *8.12*	147 *7.27*	145 *6.47*	148 *7.90*	145 *6.74*
Weight (in kgs)	ns	****	28.8 *6.01*	33.5 *8.84*	36.4 *9.78*	36.8 *6.99*	40.8 *7.66*	*40.3* *8.21*
Waist Circumference (in cms)	ns	****	55.4 *4.17*	59.3 *7.04*	60.3 *9.17*	62.7 *6.97*	64.8 *6.74*	65.7 *8.58*
Hip Circumference (in cms)	ns	****	68.0 *6.52*	71.9 *7.40*	75.0 *7.99*	75.3 *6.61*	78.3 *6.26*	77.6 *7.83*
Fasting Blood Glucose (FBG) (mmol/l)	ns	**	3.79 *0.76*	4.07 *0.55*	4.19 *0.49*	4.23 *0.56*	3.97 *0.62*	4.39 *0.55*
Total Blood Cholesterol (TBC) (mmol/l)	ns	**	3.96 *0.47*	4.12 *0.58*	4.03 *0.51*	4.35 *0.68*	4.48 *1.13*	4.57 *0.66*
Body Mass index (BMI) wt/ht^2	ns	****	15 *2.0*	17 *3.1*	17 *3.6*	18 *2.8*	19 *2.5*	19 *3.1*
Waist-hip Ratio (WHR)	ns	*	0.82 *0.05*	0.82 *0.05*	0.80 *0.05*	0.83 *0.04*	0.83 *0.04*	0.85 *0.05*

* = $P<0.05$, ** = $P<0.005$, ***=$p<0.0005$, **** =$P<0.00005$

Raw data for anthropometric and blood measurements is given as appendix 9.

Table 3-13: Mean Anthropometric And Blood Measurements Of Girls From The Six Groups According To Group

Measurements	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			n-64	n=67	n=39	n-51	n=14	n=33
			Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
Age (in months)	ns	ns	139 *17*	138 *12*	137 *9*	137 *6*	136 *7*	136 *7*
Height (in cms)	ns	****	141 *9.95*	146 *7.10*	148 *7.26*	148 *7.24*	148 *12.0*	148 *7.40*
Weight (in kgs)	ns	****	32.9 *8.20*	36.0 *7.64*	40.3 *10.7*	40.7 *9.10*	42.4 *13.0*	*39.5* *9.28*
Waist Circumference (in cms)	ns	****	56.1 *5.45*	57.5 *6.23*	61.8 *8.22*	63.5 *7.85*	63.6 *9.65*	60.4 *7.05*
Hip Circumference (in cms)	ns	****	73.9 *7.31*	76.5 *8.66*	81.2 *9.37*	79.8 *8.07*	80.5 *10.9*	78.5 *6.90*
Fasting Blood Glucose (FBG) (mmol/l)	ns	****	3.65 *0.43*	4.38 *0.60*	3.69 *0.31*	4.05 *0.55*	3.93 *0.70*	4.04 *0.61*
Total Blood Cholesterol (TBC) (mmol/l)	ns	** **	3.97 *0.40*	4.01 *0.55*	3.93 *0.47*	4.49 *0.95*	4.61 *0.79*	4.40 *0.67*
Body Mass index (BMI) wt/ht^2	ns	***	16 *3.2*	17 *3.0*	18 *3.9*	19 *3.4*	19 *4.9*	18 *3.5*
Waist-hip Ratio (WHR)	ns	****	0.76 *0.04*	0.75 *0.05*	0.76 *0.05*	0.79 *0.05*	0.79 *0.05*	0.77 *0.05*

* = P<0.05, ** = P<0.005, ***=p<0.0005, **** =P<0.00005

Table 3-14: Percentage Distribution Of Boys and Girls From Each Group into Three Categories Of BMI, WHR, TBC and FBG

				GROUP					
		P (UK3)	P (PK4)	RrP	LaP	AfP	BrP	BrI	BrC
				%	%	%	%	%	%
BMI RANGE	Girls Boys	ns ns	ns *	n 55 n=64	n–64 n=67	n 76 n=39	n=65 n=51	n 19 n=14	n–41 n=33
< 20	Girls Boys			87 96	84 88	68 90	75 82	68 64	76 58
20 to 25	Girls Boys			11 4	14 10	26 3	20 16	21 36	20 39
> 25	Girls Boys			2 0	2 1	5 8	5 2	11 0	5 3
WHR RANGE	Girls Boys	ns ns	**** ns	n–55 n=64	n=64 n=67	n–76 n=39	n–65 n=51	n–19 n=14	n=41 n=33
<0.76	Girls Boys			85 87	80 75	82 78	57 62	47 62	57 43
0.76 to0.89	Girls Boys			13 11	16 19	13 22	24 24	24 31	31 39
>0.89	Girls Boys			2 2	4 6	4 0	19 14	29 8	11 17
TBC RANGE	Girls Boys	ns ns	** *	n 46 n 53	n 49 n 48	n 45 n 32	n 54 n 42	n–17 n=13	n 35 n=23
< 4.41 mmol/l	Girls Boys			62 54	4 37	60 23	26 23	39 43	33 12
4.41 to 5.2 mmol/l	Girls Boys			36 36	80 51	40 65	67 56	44 50	61 65
> 5.2 mmol/l	Girls Boys			2 10	16 12	13 0	7 21	17 7	6 23
GLUCOSE RANGE	Girls Boys	ns ns	**** *	n 46 n 53	n 49 n 48	n–45 n 32	n 54 n–42	n=17 n–13	n=35 n=23
< 3.7	Girls Boys			63 8	60 6	55 13	27 4	28 0	49 0
3.7 to 4.7	Girls Boys			37 83	40 83	44 82	65 84	72 93	51 79
> 3.7	Girls Boys			8 0	11 0	1 5	8 12	7 0	21 0

* = P<0.05, ** = P<0.005, ***=p<0.0005, **** =P<0.00005

3.4 Discussion

This chapter disclosed differences in physical characteristics of children and socio-demographic characteristics of parents. There were differences in these characteristics between South Asians and Caucasians and within the South Asian groups.

Differences in demographic characteristics of parents

The inter group educational and occupational differences observed in the three groups of parents in UK were similar to those found nationally. British Pakistani parents were comparatively less educated and a higher proportion belonged to lower social classes than British Caucasian or British Indian parents. In 1994 less than 25% of Pakistani women (aged 25-44) were economically active compared to 69% of Indian and 75% of white females (CSO, 1995). A similar trend was noted in this sample. In addition to having lower socio-economic status and a lower percentage of working mothers, British Pakistanis had larger families and British Pakistani mothers had shorter length of stay in UK than British Indian mothers.

Differences in children's physical characteristics

Stunting was more common among British Pakistani children, particularly girls, as compared to British Caucasian or British Indian children. None of the three groups in Pakistan showed the extent of stunting (42%) reported in National Nutrition Survey of Pakistan 1988b. This is probably because both the urban and rural groups in this sample did not include the poorest groups.

In contrast to this study, the Pakistan National Nutrition Survey (NNS) did not report a higher prevalence of stunting in girls. The difference might be due to differences in age profile of the groups. In the National Nutrition Survey report, children from birth to 18 years of age were grouped together. Differences in rates of stunting in relation to socio-economic status were however reported in NNS and by other researchers.

Differences observed in TBC, FBG, BMI and WHR of rural and urban children of Pakistan were of a similar nature as observed previously when more and less urbanised populations have been compared on a larger scale (Popkin 1994). Comparison of TBC, FBG, BMI and WHR of South Asians and Caucasian children showed a similar pattern of differences as observed in respective adult populations i.e. similar or low BMI and cholesterol but higher WHR and diabetic tendency in South Asians, (McKeigue et al 1991, Miller et al 1993). These are discussed in more detail in chapter 7.

The overall picture which emerges from these differences in general characteristics of children and their families is that there are inter group and intra group differences in demographic and behavioural characteristics of British and Pakistani children and their families. In general differences between rural and urban children in Pakistan and differences between British Pakistani and Pakistani children in Pakistani are more frequent and more significant than differences between British Pakistani and British Caucasian or British Indian children. However British Pakistani children do not match completely either with British Indian or British Caucasian children.

The type of differences between rural and affluent Pakistani children and between rural Pakistani and British Pakistani children were of a similar nature. While rural Pakistani children had physical characteristics typical of less urbanised populations i.e. higher level of stunting, lower prevalence of obesity and lower levels of fasting blood glucose and total blood cholesterol; both the affluent Pakistani and British Pakistani groups had lower prevalence of stunting, higher prevalence of overweight and higher FBG and TBC levels. Although the degree of differences between rural and affluent Pakistani group and rural and British Pakistani groups was not always exactly the same, the similarity in the trends of differences supports the hypothesis that migrants to more urban environments experience similar differences in health related characteristics as are found in rural-urban populations at any particular time.

4. FOOD HABITS

This chapter describes differences in dietary habits of the children. The chapter is divided into three sections: the first section deals with differences in meal patterns, the second with differences in food and nutrient intake and the third with food related views and attitudes.

4.1 Meal Patterns

Introduction

In this section, differences in meal patterns of children are presented under separate headings of breakfast, midmorning snack, mid-day meal, afternoon snack, evening meal and late night snack. The main source of information for this section was three day dietary records. These records provided information about foods eaten, time of eating, where eaten and with whom. The total number of different foods mentioned by children in their food records was 521 for the British group and 359 for the Pakistani group. Eighty food categories were made to accommodate dietary information in such a way as to depict nutritional as well as cultural aspect of foods simultaneously. (A glossary of asian foods and Urdu terms used in tables or text is given as appendix 10 and the list of eighty food groups with a brief description is given and as appendix 11). When food consumption from any particular group was negligible (i.e. less than 5% of children from each group ate it) it does not appear ' in the tables.

The eighty categories were same the for British and Pakistani children. Where information was available from questionnaires as well (breakfast and mid-day meal), results from the two sources are compared.

Three criteria were used to classify any eating occasion as a particular meal or snack; time, types of food consumed and ordinal position of eating occasions. The first eating occasion of the day, at which breakfast type foods or drinks were consumed (provided it was before school time on week days and before noon at weekends) was considered to be breakfast. A mid-day eating occasion at which meal type foods were consumed was called mid-day meal or lunch. Similarly an evening eating occasion having meal type foods was termed evening meal or dinner. Eating occasion(s) falling between breakfast and mid-day meal were called mid-morning snack; those between mid-day meal and evening meal were named afternoon snack and ones after evening meal as evening snack.

The places where foods were eaten were grouped as, home, school, other's home and outside. Home meant children's own home; school included their regular school on week days and any other school like institution on week ends for example Urdu school, religious school, art school etc.; Other's home meant relatives or friends home and outside included eating on the street, cafe, restaurant etc. It was not feasible to further elaborate this category because of the very low frequency of eating at these places in any of the six groups.

Information about the persons with whom the food was eaten were grouped into parents, siblings, friends, relatives and alone. If the foods were eaten with any or both of the parents it was categorised as being eaten with parents irrespective of whether other family members were present or not. If the foods were eaten with one or more siblings and neither of the parents were present it was categorised as being eaten with siblings. The categories friends and relatives were used if food was eaten at their homes even if parents and siblings were also present.

The six groups of children differed in their meal patterns in various ways. Differences noted in the pattern of various meals are discussed under separate headings. Information about average number of eating occasions per day, modal mealtimes, median number of food items at each eating occasion and percentage of children from each group who ate any particular meal and where and with whom various meals were different groups of children is presented in appendix 12a-12e. Reference to this information is made under the specific meal headings.

4.1.1 Breakfast

Breakfast was eaten by the majority of children (92-100%) from each group in our sample. However British Pakistani children were most likely to miss breakfast on weekdays. Four percent each of British Caucasian and British Indian children and eight percent of Pakistani children missed breakfast on week days. Among the Pakistani children in Pakistan, the tendency to miss breakfast on week days was slightly lower than it was in

British Pakistani children. None of the rural children missed breakfast and only 3% of less affluent Pakistani and 2% of affluent Pakistani children missed breakfast on week days. However on weekends British Pakistani children matched their rural counterparts in Pakistan and none of them missed breakfast. None of the British Caucasian but four percent of British Indian children missed breakfast on week ends. Information from activity records indicated that in most cases breakfast was missed on week ends because of getting up late.

Information about the breakfast pattern of children was also available from the questionnaires. Children's responses from questionnaires regarding missing breakfast did not coincide with the information provided in diaries. In all the six groups a higher proportion of children mentioned eating nothing at all in the questionnaires than those who mentioned eating nothing before coming to school in food records. Information regarding food consumption at breakfast had different degrees of agreement for different foods and different groups. In general there was better agreement between the questionnaires and diary in the responses of the Pakistani sample. (for details see appendix 13a).

4.1.1 Mid-morning Snack

Among the British children about 60% of children from each group had any food at this time while on week ends British Caucasian had the highest frequency of consuming this snack (79% BrC vs 48% BrI, 37%, BrP). Among the Pakistani children, rural children least frequently ate some thing at this time both on week days and week ends. Eating at this time was most common among affluent Pakistanis as ninety percent of children ate something at this time. Consumption of a Mid-morning snack was more common on week days than on week ends in all the South Asian groups and the difference was more marked among the Pakistani groups in Pakistan. In contrast British Caucasian children ate something at this time more often on week ends (79%) than on week days (66%) (for details see appendix 13b).

4.1.2 Mid-day meal

The mid-day meal was eaten by the majority (93-100%) of children from each group on both week days and week ends. Considering both week days and week ends British

Caucasian children seemed to miss this meal most often (5% and 7% on week ends and week days).

The three groups of children in the UK had their mid-day meal mostly at school on week days and at home on week ends. The two British South Asian groups were different from the British Caucasians in two aspects: South Asian children had their mid-day meal at home more frequently (34-40%) than the Caucasians (23%) on week days and on week ends the Caucasian children had their mid-day meal outside home more frequently (27%) than South Asian children (6-7%). Consequently overall British Asian children had their mid-day meal at home more frequently than the British Caucasian children (for details see appendix 13c).

4.1.3 Afternoon snack

In the UK British Pakistani children less frequently (73%) ate anything at this time than British Caucasian (81%) or British Indian children (80%). Among the Pakistani children rural Pakistani children had the lowest frequency of eating anything at this time both on week days (60%) and week end days (35%) as compared to affluent Pakistani (81%WD & 62 % WE) and less affluent Pakistani children (74%WD & 61%WE). However for all the six groups taking Afternoon snacks was more common on week days than on week end days (for details see appendix 13d).

4.1.4 Evening meal

In each group, a relatively higher proportion of children ate this meal on week days (93-100%) than on week end days (79-92%). The greatest difference in this regard was noted among British Caucasian children. None of them missed this meal on week days but 21% skipped it on week ends. Among the Pakistani children affluent urban ones skipped this meal most often; 13% children from the affluent group, 8% of less affluent urban and 10% of rural Pakistani children skipped this meal (for details see appendix 13e).

4.1.5 Evening snacks

In the UK British Caucasian children had food at this time significantly more often (60%WD & 33%WE) than British Pakistani (28%WD & 14%WE) or British Indian

(46%WD & 38%WE) children both on week days and on week end days. British Indian children ate something at this time significantly more often than British Pakistani children both on week days and week ends. Among the Pakistani groups the difference between the two urban groups was not marked, while rural children ate something a this time less often (21% WD and 8%WE) than did affluent (38% WD and 25%WE) or less affluent urban (34% WD and 25%WE) Pakistani children(for details see appendix 13f).

The typical meal patterns which emerge from the results of this section distinguishes the differences in food habits of the six groups of children. Table 4-1 & 4-2 show typical meal patterns for each group on weekdays and week ends. The number of food items presented for each meal and group is according to the modal number of food items consumed.

Table 4-1: Typical Week Days Meal Pattern Of Each Group

RrP	LaP	AfP	BrP	BrC	BrI
BREAKFAST					
Bread Asian, Fried	Sliced Bread	Sliced Bread	Breakfast Cereal	Breakfast Cereal	Breakfast Cereal
Tea	Tea	Milk	Milk Whole	Milk Skimmed	Milk Whole
MID-MORNING SNACK					
Asian Snacks	Naan	Asian Snacks	Crisps	Crisps	Crisps
	Potato Kabab				
MID-DAY MEAL					
Chapati	Chapati	Chapati	Potato Chips	Potato Chips	Potato Chips
Lentil Curry	Lentil Curry	Lentil Curry	Baked Beans	Meat Burger	Baked Beans
			Fruit Drink	Baked Beans Fruit Drink	Fruit Drink
AFTERNOON SNACK					
Tea	Tea	Tea	Sweets/Crisps[1]	Chocolates/ Fizzy Drink[1]	Fruits
EVENING MEAL					
Chapati	Chapati	Chapati	Chapati	Potato Chips	Chapati
Curry	Curry	Curry	Curry	Vegetables	Curry
				Meat Sausages	Yoghurt
EVENING SNACK					
Fruits	Milk	Ice Cream	Fruits	Crisps/ Tea[1]	Fruits/Milk[1]

[1]bimodal variable

Table 4-2: Typical Meal Pattern Of Each Group At Week Ends

RrP	LaP	AfP	BrP	BrC	BrI
BREAKFAST					
Bread Asian, fried	Bread Asian, fried	Bread Asian, fried	White Sliced Bread	Breakfast Cereal	White Sliced Bread
Tea	Tea	Fried Egg	Tea	Milk Whole	Tea
MID-MORNING					
Dessert, Asian	Fruits	Ice Cream /Biscuits	Fruits	Crisps	Biscuits
MID-DAY MEAL					
Chapati	Chapati	Chapati	Chapati	Fried meat	Chapati
Curry	Curry	Curry	Curry	Potato Chips	Curry
				Raw or Boiled Vegetables	yoghurt
AFTERNOON SNACK					
Biscuits/ Dessert, Asian/tea	Tea	Tea or Coffee	Crisps	Tea/Cakes	Crisps
EVENING MEAL					
Chapati	Chapati	Chapati	Chapati	Fried meat	Chapati
Curry	Curry	Curry	Curry	Raw or Boiled Vegetables	Curry
Yoghurt, plain		Chutney	Raw or Boiled Vegetables	White bread/pudding	Fizzy Drink
EVENING SNACK					
Nuts	Milk Whole	Milk Whole	Fruits	Tea or Coffee/ Fruit drink	Milk Whole

4.2 Frequency of Food Consumption

Information obtained through questionnaires and food records revealed significant inter group differences in the frequency of consumption of different foods. The overall picture which emerged from these data was that, predictably, the food consumption pattern of British Pakistani children was more westernised than that of children in Pakistan. However their frequency of consuming various foods was neither exactly similar to that of British Caucasian children nor to that of any particular group of children in Pakistan. However British Pakistani children were closer to British Indian rather than British Cauacasian children. In relation to children in Pakistan, British Pakistani children were more like affluent urban Pakistani children rather than rural Pakistani ones, in terms of their food consumption.

A summary of findings regarding the differences in frequency of food consumption is presented here (For details see appendix 14).

4.2.1 Meat, fish & eggs

The three groups of children in UK differed not only in overall frequency of meat, fish and egg consumption, but also in the forms in which these foods were eaten. Consumption of red meat was higher and that of chicken was lower among British Caucasian children as compared to British Pakistani and British Indian children. While British Caucasian children mostly ate these foods grilled or fried, both the South Asian groups in UK mostly ate them in the form of curry.

British Pakistani children showed some indications of acculturation in their meat, fish and egg consumption. They ate fish more often (mostly fried and grilled) than children in Pakistan. British Pakistani children ate boiled and poached eggs more often and fried eggs less often than children in Pakistan. However consumption of red meat, probably because of concern with its being halal, was not higher among British Pakistani children as compared to children in Pakistan.

In Pakistan consumption of most of the foods from this group was higher among the urban groups as compared to the rural group (For details see appendix 14a).

4.2.2 Milk & milk products

Frequency of consuming milk did not appear to be significantly different between the three groups of children in UK, however British Pakistani and British Indian children showed a trend of consuming whole milk more often and semi-skimmed milk less often, than British Caucasian children. British Indian children had significantly more frequent consumption of yoghurt as compared to the two other British groups.

British Pakistani children consumed whole milk significantly less frequently and cheese significantly more frequently as compared to children in Pakistan. In Pakistan affluent urban children showed a tendency to consume milk more frequently than less affluent or rural children (For details see appendix 14b).

4.2.3 Fruits and vegetables

Both the South Asian groups of children in UK consumed lentils more frequently and chips less frequently than British Caucasian children. In Pakistan lentils were consumed more frequently in the rural group. British Pakistani children appear to be closer to rural children in their frequency of consuming vegetables, but not lentils. Consumption of western style vegetarian snacks (vegetable burger, pizza, chips etc.) was significantly higher among British Pakistani children as compared to any group of children in Pakistan. However consumption of these foods was higher among urban Pakistan children as compared to rural Pakistani children(For details see appendix 14c).

4.2.4 Breads and cereals

Overall consumption of bread was higher among the British Pakistani and British Indian children as compared to British Caucasian children. Although their overall frequency of consuming wholemeal breads was very high, because of eating chappati (made from whole wheat flour); when they ate english bread unlike British Caucasian children it was mostly white bread.

British Pakistani children's pattern of consuming bread and cereals was closer to that of affluent urban children. Rural and less affluent Pakistani children ate english breads less frequently than the affluent Pakistani children (For details see appendix 14d).

4.2.5 Biscuits, cakes and desserts

In the UK the only significant differences between the South Asian and Caucasian children were in the consumption of pies and asian sweets. Consumption of pies was more frequent in the Caucasian group and that of asian sweets in the South Asian groups. Consumption of cakes was significantly higher and that of asian sweets lower in the British Pakistani group as compared to children in Pakistan. Affluent Pakistani children had more frequent consumption of cakes and ice creams as compared to rural or less affluent Pakistani children and thus were closest to British Pakistani children in this respect (For details see appendix 14e).

4.2.6 Sweets and chocolates

There was no significant difference between the three groups of children in UK, in their consumption of sweets and chocolates. British Pakistani children had much higher consumption of sweets and chocolates when compared to children in Pakistan. However they were closest to affluent urban Pakistani children in this respect, who had a higher consumption of these items as compared to the two other groups of children in Pakistan (For details see appendix 14f).

4.2.7 Hot and cold drinks

In the UK both the South Asian groups consumed fruit drinks and tea more often and fizzy drinks less often than the Caucasians. Furthermore, British Pakistani children had significantly more frequent consumption of fizzy and fruit drinks and lower consumption of tea as compared to children in Pakistan. They were again closest to affluent urban Pakistani children in these respects, who had higher consumption of fruit and fizzy drinks and a lower consumption of tea as compared to less affluent urban or rural children in Pakistan (For details see appendix 14g).

4.2.8 Fats, spreads and sauces

The only significant difference between the three group in UK, in terms of consuming fats, spreads and sauces, was that both British Indian and British Pakistani children reported consuming ghee more often than British Caucasian children. British Pakistani children reported significantly less frequent consumption of ghee than any group of children in Pakistan. Consumption of ghee as well as of vegetable oil was more frequent in the affluent urban Pakistani children as compared to rural or less affluent urban Pakistani children (For details see appendix 14h).

4.3 Changing Food Habits

4.3.1 Exposure to Western Culture and Acculturation in Food Habits

- ***Exposure to Western Culture***

Information about involvement of children in various socio-cultural activities, obtained through questionnaires was used to assign a western exposure score to each child (based on the method used by Kassam-Khamis (1996). Children were asked to mention how often they undertook activities like visiting Caucasian or Asian friends, watching English or Asian television programmes, etc. For each activity they were given a score of 0-4 according to the frequency of participation (never, once/twice a year, once/twice a month, weekly, twice a week or more). Two separate scores were calculated for traditional and modern activities by adding the total score for all the traditional and modern activities separately. The modern/western activity score was divided by the traditional activity score to get a ratio representing relative involvement in western activities. This was called Western Exposure Score. Higher score more indicated more westernised activity pattern.
Children were categorised into tertiles (33rd percentile) according to their western score and were assigned exposure rank 1 to 3 accordingly. Higher ranks meant more frequent involvement in activities which increased exposure to western culture (see appendix 15).

- ***Acculturation in Food Habits***

Information about frequency of consuming various types of foods available from food records was utilised to assess acculturation in food habits. The foods were re-coded as being traditional (typical Pakistani or Indian foods, curries chapatties etc.), modern (typical western foods like chips, pizza. pies, biscuits, cakes etc.) or neutral (like milk, tea, fruit etc.). Acculturation score was derived by the following formula:

$$\text{Acculturation score} = \frac{\text{Total number of traditional foods}}{\text{Total number of modern foods}}$$

Children were assigned acculturation rank ranging from one to three by dividing them into tertiles of acculturation scores.

Table 4-3: Exposure And Acculturation Score Of British Asian Children

Exposure And Acculturation Score Of British Asian Children								
	BrP				BrI			
	n=70				n=50			
	Mean	Max.	min	SD	Mean	Max.	min	SD
Traditional Score	22.1	32.0	11.0	4.86	20.0	30.0	10.0	5.22
Western Score**	9.58	14.0	1.00	2.76	9.95	14.0	5.00	1.78
Exposure Score	0.46	1.09	0.15	0.17	0.52	1.00	0.28	0.14
Traditional. Food	5.09	13.0	0.00	2.64	4.45	12.0	0.00	3.12
Modern. Food	17.4	43.0	5.00	6.56	19.8	32.0	6.00	5.77
Neutral Food*	6.27	21.0	0.00	4.76	6.66	15.0	0.00	3.56
Acculturation Score***	4.13	16.5	1.08	2.73	7.02	27.0	1.00	6.62

*p<0.05, **p<0.005, ***p<0.0005

- ***Ethnic differences in exposure to western culture and acculturation in food habits.***

British Pakistani children had a lower mean exposure score (0.46) and a lower mean acculturation score (4.13) than the British Indian children (0.52 & 7.02 respectively). Comparison of acculturation and exposure ranks (chi sq.) and mean scores (t-test) indicated that the difference was statistically significant for the exposure ranks but not for the acculturation ranks.

- ***Relationship between exposure to western culture and acculturation in food habits***

When both the Asian groups were studied together exposure had a negative non significant correlation with consumption of traditional foods and a positive significant (p=0.036) correlation with consumption of non-traditional foods.

For Pakistani children exposure was positively (ns) correlated to consumption of all the three types of foods while for Indian children exposure was negatively correlated to the consumption of traditional ($p=0.03$) and neutral foods (ns) and positively related to the consumption of western foods (ns). Probably more exposed British Pakistani children due to economic or other reasons were eating a more varied diet.

Table 4-4: Acculturation Rank Of British Asian Children

ACCULTURATION RANK OF CHILDREN			
Acculturation Rank	BrP (n=70)	BrI (n=50)	Sign
	Col %	Col %	
1 *(Low)*	37.6%	27.9%	ns
2 *(Medium)*	37.6%	29.5%	
3 *(High)*	24.7%	42.6%	

Table 4-5: Exposure Rank Of British Asian Children

Exposure Rank Of Children			
Exposure Rank	BrP (n=70)	BrI (n=50)	sign.
1 *(Low)*	41.4%	21.0%	**
2 *(Medium)*	39.1%	32.3%	
3 *(High)*	19.5%	46.8%	

**=P<0.005

Table 4-6: Relationship Between Exposure And Acculturation

Relationship Between Exposure And Acculturation And Consumption Of Traditional Food, Modern Foods And Neutral Foods		
	Spearman's r (significance)	
Exposure Rank By	BrP (n=70)	BrI (n=50)
Acculturation Rank	-0.06 (ns)	0.18 (ns)
Modern Foods	0.11 (ns)	-0.3 (ns)
Traditional Foods	0.17 (ns)	-0.03 (ns)
Neutral Foods	0.05 (ns)	0.34 (*)

*=P<0.05

4.3.2 Parent's eating habits as a child in comparison to those of their children.

The first question about parents eating habits was "Did you eat similar food in your childhood as your 10-12 year old son or daughter does now?" in the UK sample 50% of British Pakistani, 57% of British Caucasian and 49% of British Indian parents thought they ate different food in their childhood compared with their child. In the Pakistani sample relatively fewer parents (21-28%) reported eating in a similar way. This may be due to general difference in rate of change in availability of foods in the two countries.

Foods which British Caucasian parents reported eating more often than their children included vegetables, fish and fruit and those eaten more often by Indian and British Pakistani parents were vegetables, fruit and chapati. Foods eaten less often by British Caucasian parents were burgers, chips and pizza and those by British Indian and British Pakistani parents were chips, crisps and sweets.

No particular pattern was evident in respect of specific foods being eaten more or less by Pakistani parents in Pakistan. The same foods appeared in the list of less eaten and more eaten foods. Probably different families were at different stages of vertical or horizontal social mobility and consequently the change in their food habits was more related to those factors.

However if only the mode is taken into account all the three group of parents in Pakistan ate less meat and more vegetables as children than their child. While a similar pattern was indicated in foods eaten more by parents in the past, migrants to UK and Pakistani parents had a different repertoire of foods eaten less when they were a child. The difference was probably due to different food environments. British Pakistani parents mentioned eating sweets, chips and crisps less often than their child, while Pakistani parents in Pakistan mentioned eating meat milk, eggs and certain vegetables along with sweets and chocolates less often than their child.

It appears that parents overall as a child, ate less fatty and sugary foods and more vegetables than their children.

Table 4-7: Parents' Childhood Eating Habits According To Group

	Group						significance	
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	%	%	%	%	%	%		
	n= 73	n– 113	n 94	n= 112	n= 30	n= 72		
Did you eat the same kind of foods as your son/daughter?							ns	**
◊ yes	34	44	64	39	37	46		
◊ no	28	21	22	50	57	49		
◊ do not know	38	35	14	11	6	5		

**=P<0.005

Table 4-8: Foods Eaten More And Less Often by Parents in Their Childhood Than Their Children According To Group

	Group					
	Rural Pakistani	Less Affluent Pakistani	Affluent Pakistani	British Pakistani	British Caucasian	British Indian
Foods Eaten Less Often By Parent	Meat Milk Aubergine	Meat Sweets Milk.	Meat Eggs Chocolate	Sweets Chips Crisps	Burger Chips Pizza	Chips Crisps Sweets
Foods Eaten More Often By Parent	'Saag' Rice Meat	Vegetable Meat Milk	Vegetable Meat Rice	Chapati Vegetable Milk	Vegetable Fish Fruit	Vegetable Fruit Chapati

4.4 Nutrient Intake Of Children

The nutrient intake of children was calculated separately for each of the three record-keeping days. In order to get a balanced representation of weekdays and week ends, mean intake of two week days was multiplied by five and intake on week ends by two. The resulting two figures were added together and divided by seven to get the figure for mean daily intake representing the whole week. For Pakistani children means of weekly intake were multiplied by six and added to intake on week ends; the resulting figure was divided by seven to get mean daily intake for each individual representing the whole week. The mean intakes of macro and micro nutrients are presented in table 4-9 and 4-10.

Mean total energy intake of all the six groups of children was lower than the recommended energy intakes for the relevant age and sex group. Assessment of the degree of underreporting according to Goldberg et al (1991) criteria (EI:BMR<1.2) revealed a level of underreporting (41%, RrP; 24%, LaP; 38%, AfP; 45%, BrP; 43%, BrC; 45%, BrI). However their was no significant difference between the groups in terms of proportion of children who underreported or in the mean EI:BMR for each group.

Comparison of the three groups of British Children

- *Source of energy*

The three UK groups of children did not differ significantly in the total energy intake but they did in the relative proportion of energy coming from fats, protein or carbohydrates. Both British Indian and British Pakistani children had a significantly higher percentage of energy coming from carbohydrates (57 5 &57.8%) and significantly lower energy coming from fats (34% each) and protein (11.8% BrP & 12.5 % BrI) in their diets compared to British Caucasian children. In Caucasian children's diets 38% of total energy was provided by fats, 52 percent from carbohydrates and 13% from protein British Indian and British Pakistani children did not differ from each other in the percentage of energy from fat and carbohydrates, but British Indian children had a slightly but significantly ($p<0.05$) higher percentage of energy (12.5 %) from protein in their deits, as compared to British Pakistani children (11.8%).

- ***Protein***

Mean protein intake was highest for the Caucasian (54g) followed by British Indian (52g) and least by British Pakistanis (47g) children, but the difference was not statistically significant.

- ***Fats***

Mean total fat intake was higher for the Caucasian (71g) than the Indian (63g) or British Pakistani (62g) and mean PUFA intake was highest for British Pakistani (15g) followed by British Indian (13g) and then Caucasian (12g) children but these differences were not statistically significant. However the intake of monounsaturated fatty acids (MUFA) and saturated fatty acids (SFA) was significantly higher among British Caucasian children (27g & 12g) in comparison to British Indian (21g &13g) or British Pakistani children (20g &15g). These differences were shown more clearly in the difference in P:S ratio which was significantly higher for Pakistani children (0.8) in comparison to Caucasian (0.5) as well as British Indian children (0.6). British Indian children and a higher P:S ratio than the British Caucasian children and this difference also was significant.

Cholesterol: British Pakistani children had a significantly lower mean intake of cholesterol (127mg) than the Caucasian (175mg) or Indian children (145mg). The two South Asian groups did not differ significantly from each other.

- ***Carbohydrates***

Differences were not statistically significant in the mean intake of total carbohydrates or sugars but mean intake of starch and NSP was significantly higher among the British Indian (147g, &13g respectively) and British Pakistani children (146g & 13g respectively) than the Caucasian (124g & 10g respectively) children.

- ***Minerals***

British Indian children had a much higher intake of calcium (684 mg) than the Caucasian (589mg) or British Pakistani children (575 gm). Mean iron intake was not significantly different between the three groups.

- ***Vitamins***

Pakistani children had a significantly lower mean intake of thiamine (0.9mg), riboflavin (0.9) and niacin (19mg) and vitamin A (127ug) than the Indian or Caucasian children. Both Pakistani and Indian children had significantly higher mean intake of vitamin E (5.1 & 5.2 mg respectively) than the Caucasian children (4.4mg). No significant difference was noted in mean vitamin C intake of the three groups of British children.

Table 4-9: Mean Nutrient intakes Of Children (Macro Nutrients) According To Group

Nutrients	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
			n 40	n 81	n-59	n 83	n 29	n=65
KCalories	ns	*	1481 282	1753 439	1649 412	1603 408	1651 392	1664 412
KJoule	ns	*	6208 1181	7353 1844	6914 1728	6735 1713	6938 1647	6988 1728
Protein (g)	ns	**	44 9	53 14	52 13	47 13	54 16	52 15
Fat (g)	ns	***	53 16	72 22	70 22	61 21	71 20	63 22
PUFA (g)	ns	**	11 4	13 4	13 6	15 6	12 7	13 7
MUFA (g)	**	****	12 4	17 6	19 6	20 8	27 8	21 9
SFA (g)	**	***	17 6	22 8	25 10	20 8	25 7	22 8
CHO (g)	ns	ns	222 41	240 66	217 59	230 55	213 57	237 61
Sugar (g)	ns	****	38 19	48 22	53 29	82 33	85 39	87 29
Starch (g)	*	****	170 30	179 50	149 49	146 36	124 23	147 46
NSP (g)	**	ns	13 4	13 4	12 5	13 4	10 3	13 5
Cholesterol (g)	ns	****	115 78 6	161 106	196 109	127 84.6	175 96.1	145 90.7
P:S Ratio	****	**	0.68 0 32	0.66 0.29	0.60 0 27	0.82 0.43	0.50 0.26	0.63 0.33
%E[1], CHO	****	****	60 6	55 6	53 7	58 6	52 6	58 7
%E, Protein	*	*	12.0 1	12 2 2	12 8 2	11 8 2	13 3	12.5 2
%E, Fats	**	****	32 6	37 6	38 7	34 5	38 6	34 6

[1] %E= Percentage energy

*=P<0.05, **=P<0.005, ***=P<0.0005, ****=P<0 00005

Table 4-10: Mean Nutrient intakes (Micro Nutrients) According To Group

Nutrients	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
			n–40	n 81	n 59	n=83	n–29	n=65
Calcium (mg)	*	**	425 203	553 237	634 275	575 216	589 195	684 234
Phosphorus (mg)	*	**	721 177	863 237	890 230	891 242	862 240	989 255
Magnesium (mg)	*	*	175 44	208 58	189 60	197 53	170 45	206 61
Sodium (mg)	**	****	1000 436	1477 493	1438 553	1916 640	2286 432	1813 517
Potassium. (mg)	ns	****	1303 343	1585 388	1488 400	2024 641	2220 690	2160 576
Chlorides (mg)	**	****	1430 684	2162 754	2071 863	2903 945	3337 592	2707 794
Iron (mg)	ns	***	10.5 2.4	11.3 3.1	10.6 3.5	9.2 2 7	8.4 1.8	9.4 3.2
Zinc (mg)	ns	****	6.1 1.2	7.6 2.8	6.5 2.0	5.5 1 6	6.1 1.9	6 0 1 9
Copper (mg)	ns	****	1.1 0 3	1.1 0.3	1.0 0.3	0.8 0.2	0.7 0.2	0.9 0.3
Vit B1 (mg)	**	ns	0.8 0.2	0.9 0.3	0.8 0.2	0.9 0.2	1.1 0.4	1.0 0 3
Vit B2 (mg)	*	****	2.0 1.0	1.9 1.0	1.5 1.0	0.9 0.4	1.2 0.5	1.1 0 4
Naeq (mg)	*	****	14.3 3.1	17.3 5.3	16.1 5.0	19.4 5.0	23.3 8.5	21.7 6 8
B6 (mg)	ns	****	0.8 0.2	0.9 0.3	0.8 0.2	1.4 0.4	1.6 0.5	1.5 0.4
B12 (ug)	*	ns	0.6 0.5	1.4 3.0	1.9 4.9	2.2 0.9	2.9 1.5	2.5 1.3
Folates (ug)	ns	****	84 33	94 29	93 35	151 48	150 41	158 48
Vit C (mg)	ns	****	18 22	22 24	19 15	52 37	56 49	58 31
Vit A (RE)	**	**	302 141	395 178	439 235	335 167	374 142	448 225
Vit D (ug)	ns	**	0.7 0.5	0.7 0.5	0.9 0.6	1.0 0.6	1.3 0.6	1 2 0 7
Vit E (mg)	ns	****	5.0 2.0	7.2 3.2	6.6 2.6	5.2 2.7	4.4 3.3	5 1 2 9

*=P<0.05, **=P<0.005, ***=P<0.0005, ****=P<0.00005

Comparison of nutrient intake of British Pakistani and Pakistani children

- ***Source of energy***

British Pakistani children were closer to affluent Pakistanis in their intake of energy. The mean caloric intake of British Pakistani children was significantly lower than that of less affluent Pakistani and higher but not significantly than that of rural Pakistani children. But interestingly British Pakistani children were much closer to rural Pakistani children in the sources of energy, having similar proportion of energy coming from fat and carbohydrates (57% & 34%) as did the rural Pakistani children (60% & 31%). Both the urban Pakistani groups had more energy coming from fats and less from carbohydrates in their diets than British or rural Pakistani children. British Pakistani children had the lowest proportion of energy from protein (11.8%) but were again closer to rural Pakistanis (12.0%) than the affluent (12.8%) or less affluent (12.2%) urban Pakistani children.

- ***Protein***

British Pakistani children had significantly lower mean protein intake than the affluent and less affluent Pakistani and were closer to rural Pakistani children.

- ***Fats***

Mean intake of fats by British Pakistani children was significantly lower than that of affluent or less affluent urban Pakistani children and significantly higher than the rural Pakistani children. British Pakistani had the highest mean intake of PUFA and MUFA, of any group of Pakistani children but their SFA intake was lower than that of urban children but higher than that of rural Pakistani children.

Mean cholesterol intake of British Pakistani (127mg) was less than that of urban (161 & 196mg for less affluent and affluent respectively) and more than that of rural (115mg) Pakistani.

British Pakistani children had a P:S ratio (0.85) higher than any group of children in Pakistan (0.68 RrP, 0.66 LaP & 0.60 AfP).

- ***Carbohydrates***

There was no significant difference in the mean total intake of carbohydrates, but mean sugar intake was higher and that of starch lower among British Pakistani children than any Pakistani group. The mean sugar intake ranged from 38-53g in groups in Pakistan whereas the mean sugar intake among British Pakistani children was 82g. There was no significant difference in NSP intake.

- ***Minerals***

British Pakistani children's mean iron intake was lower than any of the Pakistani groups. Mean calcium was closer to affluent Pakistanis which was significantly higher than less affluent or rural Pakistani children.

- ***Vitamins***

British Pakistani children had higher mean intake of thiamine, niacin, B6, B12, folates, vitamin C and vitamin D than any group of Pakistani children. Mean intake of vitamin A among British Pakistani children (335ug) was lower than any urban Pakistani group (395ug LaP & 439 AfP), but was higher than rural Pakistani children (302ug). Mean intake of vitamin E by British Pakistani (5.2mg) was closer to rural Pakistani (5mg) which was significantly lower than that of affluent (6.6) or less affluent (7.2) urban Pakistani children. British Pakistani children had significant higher mean vitamin C intake (52mg) than any group of Pakistani children (18-22mg).

Comparison of the three groups of Pakistani children

- ***Source of energy***

The less affluent urban children had the highest mean energy intake followed by affluent urban and was the lowest for rural children. Percentage energy from fat and protein was lowest and from carbohydrates highest for the rural children. The reverse of this was true for the affluent urban children who had the highest percentage of energy from fats and the lowest from the carbohydrates among the three groups in Pakistan. The less affluent urban children had a lower percentage of energy from fats in their diets as compared to the affluent urban children but more than that was in the diets of rural children.

- ***Protein***

Rural Pakistani children had significantly lower mean protein intake (44g/d) than the affluent (52g) and less affluent (53g) urban children.

- ***Fats***

Differences in mean fat intake were also similar to differences in protein intake being higher for the less affluent and affluent urban (72g & 70g) and lowest for rural Pakistani children (53g). Mean intake of cholesterol, SFA and MUFA as well as that of PUFA increased with socio economic level but due to a wider gap in the mean intake of SFA than in PUFA the P.S ratio was highest for the rural children (0.68) and lowest for the affluent urban (0.60). The less affluent (0.66) children were closer to the rural rather than the affluent ones. (But these findings must be treated with caution because the same database composition was used throughout, whereas the rural and less affluent are likely to use 'ghee' more often than the urban.)

- *Carbohydrates*

Less affluent urban children had the highest mean intake of total carbohydrates which was significantly higher than the affluent and higher but not significantly from the rural children. Sugar intake increased with socio-economic level and the difference between rural and affluent Pakistani children was statistically significant. the mean intake of NSP was not very different between the three groups.

- *Minerals*

Calcium and Phosphorus intake increased with socio-economic level, whereas that of magnesium, sodium, potassium, chloride, iron and zinc was lowest for the rural group and highest for the less affluent group and the latter was more closer to affluent urban than to rural group.

- *Vitamins*

Mean intake of vitamin B12, vitamin C and vitamin A increased and that of vitamin B2 decreased with inclining socio-economic level. Mean intake of B1, Niacin and Folates was highest for the less affluent and lowest for the e rural children, affluent urban being closer to less affluent urban rather than rural children. Rural and the less affluent urban were closer in the mean intake of vitamin D (0.7ug) which was lower than that of affluent (0.9ug) urban group.

The general picture which emerges from the differences in nutrient intake of Pakistani children is that the differences between nutrient intake of rural and affluent urban Pakistani children, were of similar nature to the differences between nutrient intake of rural Pakistanis and British Pakistani children. The intakes of total fat, saturated fats and sugar were higher in urban children in Pakistan in comparison with rural ones. A similar pattern was observed when rural children were compared with British Pakistani children.

The observation that NSP intake was not significantly lower when children in Pakistan were compared with British Pakistani children, is probably explained by the consumption of baked beans in the UK, which has compensated for the decline in the eating of 'dal'.

4.5 Discussion

The comparison of the food habits of the six groups of children showed the following trends.

The diets of children of Pakistani and Indian immigrants in UK were found to be significantly different from the diets of British Caucasian children. In many, but not all cases, the two South Asian groups shared a similar pattern of food consumption which was significantly different from British Caucasian children. Both the South Asian groups consumed red meat, potatoes, meat sandwiches, pies and skimmed milk less often; and fish, chicken, eggs, whole milk, wholemeal bread (chapati), rice, lentils and fruit juice, more often than the native British children. Foods which exhibited significantly different frequency of consumption by British Indian and British Pakistani children were cheese, sandwiches (all), meat sandwiches, pasta, yoghurt, cheese, pies, fish and chicken curry. The last two foods were eaten more often by British Pakistani children and all the other foods were eaten more often by British Indian children.

Although 21% of Indian children were Hindus, the differences in food consumption of British Pakistani and British Indian children do not seem to be due to vegetarianism among Hindus. According to the responses in questionnaires there was no significant difference in the consumption of meat, beef or pork between, Hindu, Sikh or Muslim children, while the consumption of meat burgers was significantly higher among Hindus and Sikhs as compared to British Pakistani children.

The findings indicate that while there are similarities in the food consumption of British Pakistani and British Indian children, the two groups have marked differences with regard to consumption of certain foods. The differences are not only significant quantitatively but also of the nature to have serious implications for health education. For example due to the differences in cheese, meat and fish consumption, messages about changing food consumption to reduce saturated fats may not be the same for both the groups. The importance of appreciating intra-group differences among South Asians is also supported by the significant differences in nutrient intake of the two South Asian groups studied here. For example although the total fat intake was similar the P:S ratio was significantly different when boys in the two South Asian groups were compared.

Some of the differences between South Asians and Caucasians and between Indian and Pakistani children have also been found in other studies. Smith et al 1993 also found that consumption of fruit and vegetables and intake of fibre was higher among South Asians. They found meat consumption to be significantly lower among Indian but not Muslims as compared to Caucasian, while in this study both British Pakistani and British Indian children had lower consumption of meat as compared to Caucasians. The reason for this difference in results is firstly that the Indians in that study were Hindus who are more likely to avoid meat as compared to Sikhs because of religious background. Another reason for lower intake of meat by British Pakistani children in this study is that the children were eating one meal on each working day at school, while in the study by Smith et al (1993) the subjects were eating home cooked food which was very often meat curries (taken as packed lunch to factory and re-heated there) at lunch, dinner and sometimes at breakfast also. Another dis-similarity in the differences found between white and South Asian adults (Smith et al 1993) and in the children (in this study) is that while the diets of South Asian adults were found to be less varied than British Caucasians the diets of South Asian children seem to be more varied than those of British Caucasian children. As they are consuming both traditional and modern foods their diets represent food items from both the categories and a greater variety results.

In cases of foods where there are no religious restrictions, differences between the diets of British Pakistani and British Caucasian children are of a similar nature as the differences between the diets of rural and urban Pakistani children.

As found in most studies looking at dietary changes accompanying exposure to urbanised lifestyle, (Almeida & Thomas, 1996) consumption of sweets, fizzy drinks and fast food increases from rural to urban and from the urban Pakistani to British Pakistani group. Consumption of meat is usually found to increase with exposure to a more urbanised environment (Karim et al, 1986). In this study meat consumption increased from rural to urban Pakistani children and also from rural to British Pakistani children but not from affluent urban to British Pakistani children. The above mentioned examples indicate that while in general the impact on dietary habits, of urbanisation within Pakistan is similar to the impact of migration of Pakistanis to UK on their diets, British Pakistani children are not always ahead of affluent Pakistani children in terms of changes in diet which typically accompany westernisation.

British Pakistani children, because of being in a developed country, would be expected to have a more westernised diet than any group of children in Pakistan. But as mentioned earlier this was not true in the consumption of meat. There are two possible reasons for that. First that the diets of British Pakistani children are more inclined to be like the diets of rural Pakistani children because of the origin of British Pakistani families. They originally come from rural areas and when they visit Pakistan they go back to that rural environment and so rural food habits might be being reinforced. Another explanation is that some of the changes which may have occurred are hampered by lesser availability of halal meat products. If halal meat dishes were available at school meals and at fast food shops, the meat consumption might have been more and vegetable and bread consumption less than it is at present. Most probably the current status of British Pakistani children's diet is a result of the effect of both the factors, but keeping in mind the importance given to religion by British Pakistani children while selecting foods it seems that the second explanation has more weight. This view is supported by the fact that where there are no religious restrictions the consumption of modern foods is much higher among British Pakistani children than any of the Pakistani children in Pakistan and is closer to be Caucasian children e.g. frequency of consuming breakfast cereals, sweets, chocolates, fruit and fizzy drinks.

Nonetheless there is also an indication that this group of subjects as they are second generation migrants are logically expected to be more acculturated in their food habits. An earlier study (Kassam-Khamis, 1996) showed that the second generation of migrants from each subgroup of Muslim South Asians studied were significantly more acculturated in their food habits. In our study a crude comparison of foods eaten at 'home dinner' and 'school dinner' by Asian children at mid-day meal on weekdays, revealed that those who went home for lunch did not always eat traditional foods. Nearly one third each of the Indian and Pakistani group ate chips even when they ate their mid-day meal at home. The reason for going home for this meal, even when they could have similar food at school (probably preferred by children as indicated by most liked foods) may be that parents found it more economical to serve similar food at home.

The differences between dietary habits of rural and urban children in Pakistan were in most but not all cases typical of dietary changes accompanying urbanisation.

Rural Pakistani children as expected ate more vegetables and bread and less meat, biscuits, sweets and fizzy drinks than urban children. These trends coincide with the results of the National Nutrition Survey (GoP 1988b) and Household Surveys (GoP 1986, 1987, 1988, 1993).These surveys by GoP also indicate that rural Pakistanis on average consume more milk than urban Pakistanis. But the rural-urban difference in milk consumption was reversed in this study. The reason may be that the rural area selected for this study was very close to a big city and had access to electricity and electronic mass media, so had more chance of being exposed to an urban environment than a typical Pakistani village. So that their lifestyle may be closer to the least affluent urban in some respects.

Another reason may be that, unlike National Surveys, in these results milk intake does not include milk used in tea. As tea consumption was higher in rural areas and they have a much higher proportion of milk in their tea (personal observation) as compared to urban children, it is likely that both frequency and amount of milk consumed by rural children is underestimated in this study.

As found by others (Almeida 1989) breakfast was the meal at which acculturation in food habits was most marked. Among the three UK groups, foods eaten at breakfast were not significantly different while between the three Pakistani groups differences in consumption of modern food (sliced bread/biscuits vs paratha) were most noticeable at breakfast.

Mean energy intake of the three groups of children in UK appeared to be less than the recommended intake for this age group (DHSS 1991). This pattern in consistent with other findings among British schoolchildren (DHSS 1989) but the difference was greater in this study. The mean energy intakes of the three Pakistani groups of children were also less than the amounts recommended for Pakistani children (Khan & Khan, 1980) and this trend was found in the National Nutrition Survey also but again the difference was greater in our study. Estimated food records tend to underestimate food consumption as compared to weighed food records. In the present study estimated three day records were used while seven day weighed food intake was recorded by the subjects in the National Nutrition Survey of Pakistan as well as in that of British Schoolchildren. So this general trend of underestimation of food intake in the present study is probably because of the difference in methodology used. In the present study the emphasis was on inter group differences rather than on comparison with national standards and as the effect of methodology was consistent in all the groups this general trend of underestimation of food intake is unlikely to affect inter group comparisons.

Questions about parent's views in relation to generational change in eating habits indicated few common trends. Among the UK group consumption of chips, sweets and fast foods seems to have increased and that of vegetables decreased in all the three group and consumption of chapati decreased among South Asian groups.

Although similar foods appear to be eaten more by some parents and less by others in the past, the modal food pattern indicates that among the three group of families in Pakistan in line with national statistics (GoP, 1993) the meat consumption has probably increased and that of vegetables decreased.

In UK Indian immigrants are found to be adopting British culture to a comparatively greater extent than Muslim families (Sheikh & Thomas, 1994). In the present study also Indian children were more acculturated in their food habits as compared to British Pakistani children.

5. EXERCISE HABITS

This chapter describes exercise habits of the children. Children's activity habits as they reported in questionnaires, information about total time spent by children in various activities as calculated by their activity records; their estimated Physical Activity Level and the mean daily energy expenditure is presented.

INTRODUCTION

Information about children's activity habits was available from the questionnaires answered by the students and from the three day activity records kept by them for two week days and one week end day. These two sources of information supplemented each other in providing a better picture of exercise patterns of children.

The information from the activity records was used to compare different groups of children in terms of time spent in various activities on week days and week ends and to assess, their Physical Activity Level and average energy expenditure per day.

Physical Activity Level was calculated according to Schofield's system (see chapter 2.1.2). According to this system activities are assigned a figure indicating their PAR (Physical Activity Ratio), the increment in energy expenditure in relation to Basal Metabolic Rate. The total time spent on various activities belonging to different categories of Physical Activity Ratio was used to calculate overall Physical Activity Level of the subject.

5.1 Children's General Exercise Patterns

Questionnaires provided information about self assessed activity habits of children, which included, times of getting up and going to bed, activities undertaken before coming to school, mode of travelling to school, actives undertaken at snack and lunch breaks in school and time spent after school in various activities.

5.1.1 Times of getting up and going to bed

The majority of Pakistani children from any group got up earlier on week days, than any group of British children. Rural children not only got up early but also went to bed earlier than any other group on week days. Ninety percent of rural Pakistani children were up before seven and in bed by nine o' clock at night. In the urban areas of Pakistan children usually take a nap after coming home from school, while afternoon naps were uncommon in rural areas. That is why in spite of getting up before 7am, more than half of affluent urban boys and girls and less affluent urban girls went to bed after 9pm. All the groups shifted to later rising and later going to bed on week ends.

Table 5-1: Times Of Getting Up And Going To Bed- Week Days And Week Ends

	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
	%	%	%	%	%	%	%	%	%	%	%	%
	n=47	n=50	n=61	n=92	n=63	n=78	n=68	n=44	n=19	n=15	n=43	n=28
Time of Getting up												
weekdays												
Before 7am	94	82	57	79	92	86	9	7	5	13	9	11
Between 7 & 9am	6	18	41	21	6	12	91	91	95	87	91	89
After 9am	0	0	2	0	2	3	0	2	0	0	0	0
weekends												
Before 7am	41	39	9	8	3	10	7	5	0	13	2	4
Between 7 & 9am	59	59	69	78	61	69	44	66	68	53	53	64
After 9am	0	2	22	14	36	21	49	30	32	33	44	32
Time of Going to Bed												
weekdays												
Before 7pm	0	4	0	3	2	1	1	2	0	0	0	0
Between 7 & 9pm	90	84	43	75	30	45	49	52	53	60	60	50
After 9pm	10	12	57	22	68	54	50	45	47	40	40	50
weekends												
Before 7pm	0	0	2	1	5	3	0	0	11	0	2	0
Between 7 & 9pm	77	55	12	34	15	13	12	10	11	7	10	11
After 9pm	23	45	86	65	80	85	88	90	78	93	88	89

5.1.2 Activities undertaken before coming to school

Eighty to ninety percent of children from any group indicated on the questionnaires having breakfast before coming to school while the percentage of children who actually took breakfast according to their food records was higher. The difference however was not statistically significant.

Rural Pakistani children mentioned ironing uniform and doing other housework before coming to school more often than did any other group of children. Whereas British Pakistani and affluent Pakistani children mentioned doing exercises more often than the rural and less affluent urban Pakistani children. Exercises done by children included running and press ups. Housework done by girls included dish washing and cleaning their own room or house, while for boys it was mostly shopping (buying milk in most cases) in the rural group and helping mum and dad for less affluent Pakistani children.

The children were asked to describe any other activities in addition to those specified in the questionnaire. These activities were usually watching TV for the three groups of children in UK as well as for rural Pakistani children and praying or studying for urban Pakistani children.

Table 5-2: Percentage Of Children Who Reported Undertaking These Activities Before Coming To School (from Questionnaires)

ACTIVITES		p (UK3)	p (PK4)	GROUP					
				RrP	LaP	AfP	BrP	BrC	BrI
	girls boys			n=40 n=32	n=54 n=63	n=45 n=39	n=54 n=34	n=15 n=11	n=40 n=21
Having breakfast	girls boys	ns ns	 **	91 76	89 78	75 89	83 85	88 92	95 78
Ironing uniform	girls boys	* ns	* ns	48 38	38 31	18 34	32 28	6 17	17 15
Housework	girls boys	ns ns	* ****	52 52	25 21	22 18	37 10	29 17	33 7
Exercise	girls boys	ns ns	* ns	7 26	5 23	18 30	20 33	24 25	7 33
Anything Else	girls boys	ns ns	ns *	16 17	21 16	20 5	20 15	29 33	36 26

*=P<0.05, **=P<0.005, ****=P<0.00005

Table 5-3: Patterns of Exercise, Housework And Anything Else (Modes) Done By Children Before Coming To School

ACTIVITIES	GROUP					
	RrP	LaP	AfP	BrP	BrC	BrI
	Mode	Mode	Mode	Mode	Mode	Mode
Girls						
Housework	Dish Washing	Dish Washing	Cleaning Room	Dish Washing	Cleaning Room	Dish Washing
Exercise	Exercise	Exercise	Walking	Exercise	Walking	Exercise
Anything Else	Watching Television	Praying	Praying	Watching Television	Watching Television	Watching Television
Boys						
Housework	Shopping	Help Mum	Cleaning Room	Cleaning Room	Cleaning Room	Cleaning Room
Exercise	Running	Running	Exercise	Press Ups	Press Ups	Press Ups
Anything Else	Watching Television	Praying	Studying	Watching Television	Watching Television	Watching Television

5.1.3 Travelling to school

Most of the UK children walked to school. Among the three UK groups however, it may be noted that more Indian and Pakistani children, particularly girls, went to school by car than the Caucasian children, although the difference was not statistically significant.

The majority of rural Pakistani girls and boys walked to school. The less affluent Pakistani children either walked to school or used a school van or public transport. The differences were mainly due to the difference in distance from school and means available. Affluent urban children rarely walked to school but were taken by car or school van.

Table 5-4: Means Of Travel To School According To Group

		p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
				%	%	%	%	%	%
Means of travel	girls boys			n=44 n=49	n=65 n=92	n=70 n=92	n=67 n=43	n=18 n=15	n=43 n=28
		ns	****						
Walk	girls boys			98 92	62 35	4 7	67 74	89 80	63 75
Car	girls boys			0 6	22 24	44 39	33 24	11 20	35 25
School bus	girls boys			0 2	9 16	40 40	0 0	0 0	0 0
Public Bus	girls boys			2 0	0 11	4 5	0 0	0 0	0 0
Other	girls boys			0 0	8 14	7 9	0 2	0 0	2 0

****=P<0.00005

5.1.4 Activities undertaken at the Mid-morning break in school

Table 5-5 shows modal activities undertaken by the six groups of children at morning break. The three groups of UK children mentioned eating less often than the children in Pakistan. The reason as stated before is that the Pakistani children have only one break during school time and this is the only time they can eat something if they want to. Another notable difference is that while Pakistani boys indicated varied play activities all the three groups of British children mentioned playing football.

Table 5-5: Modal Activities Undertaken At Mid-morning Break Time At School According To Group

	GROUP					
	RrP	LaP	AfP	BrP	BrC	BrI
	Mode	Mode	Mode	Mode	Mode	Mode
Girls	Eating	Eating	Eating	Eating	Eating	
	Talking	Talking		Talking	Talking	Talking
	Playing	Playing	Playing	Walking		Walking
Boys						
	Playing	Playing	Playing	Football	Football	Football
	Eating	Eating	Eating	Talking	Standing-Talking	Talking

5.1.5 Activities undertaken at the mid-day break

This refers to UK children only because Pakistani children do not have their mid-day meal at school and this question was not included in their questionnaires.

No particular difference was noted in type of activities mentioned by the three groups of children. Table 5-6 shows modal activities undertaken by boys and girls at lunch time. It included walking and talking by girls and playing football by boys. It excludes eating because the question asked them to mention activities undertaken besides eating. The responses indicate that the majority of boys were using lunch break as an opportunity for active play. The activities which children undertake during school breaks are likely to make a significant contribution to their total energy expenditure. Combining of lunch and play time may discourage children either from eating properly or from taking part in play. The personal observation (of the researcher) was that children spent a considerable time in queuing for lunch and then were often rushed to finish meals so that other groups could eat. While some children tried to finish eating earlier so that they could get more time for playing. It appeared that school breaks could be used as an opportunity to increase the physical activity of children.

Table 5-6: Modal Activities Undertaken At Mid-day Break At School By UKChildren

	GROUP		
	BrP	BrC	BrI
GIRLS			
	Walking	Talking	Walking
	Talking	Studying	Talking
	Any School Duty		Any School Duty
BOYS			
	Football	Football	Football
	Talking		Talking

5.1.6 Time spent after school in various activities

The results presented in this section are derived from responses to questionnaires. In the British sample, excluding praying, there was no significant difference in the reported time spent in various activities after school.

British Pakistani children watched TV more often than any group of children in Pakistan. A significantly lower percentage of British Pakistani children (6% vs 14% RrP & 31% each LaP and AfP) mentioned spending no time in watching TV after school.

Among the children in Pakistan, the activity records show that rural Pakistani children spent more time in watching TV than any other group. In the questionnaires also they mentioned watching TV before coming to school, more often than the two urban groups (see table 5-6).

It seems that urban Pakistani children were spending more time in reading, writing and drawing activities after school as the percentage of those who mentioned spending two hours or more was higher among affluent and less affluent urban Pakistani group as compared to the British Pakistani group (see table 5-7).

A higher percentage of British Pakistani children (24%) seem to spend more than one hour in active games like, cricket, hockey or football after school than Pakistani children in Pakistan (9-18%).

Table 5-7: Time Spent After School in Various Activities (from Questionnaires) According To Group

Activities	p (UK3)	p (Pk4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=92	n=133	n=150	n=102	n 33	n=73
Watching TV	ns	****						
no time at all			14	31	31	6	4	8
one hour			64	40	41	39	36	25
two hour			9	12	10	26	8	23
three hours			11	6	13	10	16	17
more than three hours			2	12	4	19	36	27
Read/Write/draw/paint	ns	****						
no time at all			14	17	7	6	12	6
one hour			26	17	26	37	40	35
two hour			26	28	21	35	32	25
three hours			21	15	19	13	12	21
more than three hours			12	24	27	10	4	13
Cricket/hockey/ football	ns	****						
no time at all			41	54	36	49	60	48
one hour			52	28	55	28	20	29
two hour			2	11	9	6	8	6
three hours			2	7	0	8	4	4
more than three hours			2	0	0	10	8	13
Home work	ns	****						
no time at all			9	2	4	1	4	0
one hour			47	41	22	33	42	24
two hour			33	32	31	33	33	41
three hours			4	11	21	24	4	18
more than three hours			7	14	22	8	17	16
Running games	ns	****						
no time at all			40	15	37	48	42	41
one hour			49	69	45	20	33	37
two hour			9	9	15	12	8	8
three hours			2	6	3	12	8	2
more than three hours			0	2	0	9	8	12
Housework	ns	****						
no time at all			24	70	38	19	28	24
one hour			49	17	33	46	64	38
two hour			10	9	18	25	4	18
three hours			10	2	6	3	4	8
more than three hours			7	2	5	7	0	12
Praying	****	****						
no time at all			10	9	16	7	76	40
one hour			69	48	46	47	16	33
two hour			17	26	22	27	8	6
three hours			5	17	7	10	0	6
more than three hours			0	0	7	10	0	15

*=P<0.05, **=P<0.005, ***=P<0.0005, ****=P<0.00005

5.2 Actual time spent in various activities

5.2.1 Comparison of three groups of British children.

Out of the fifteen categories of activities studied differences were significant in only two activities between the UK groups. On both the week days Pakistani children spent significantly more time in praying (0.4 and 0.2 hr) than the other two groups (0.0 hr) (table 5.8). Another difference was that on week ends both Indian and Pakistani children spent more time in study (1.5 & 1.6 hr respectively) than the British Caucasian children (0.55 hr) (table 5-9).

5.2.2 Comparison of British Pakistani and three groups of Pakistani children.

- ***Time spent in bed***

The four groups of Pakistani children were different from each other in mean time spent in bed. This was most probably due to different school timing and the fact that due to travelling by school vans, affluent Pakistani children spent more time in travelling to school and so wake up earlier than the less affluent who more often live nearby and walk to school.

- ***Time spent in travelling by car/van***

Affluent Pakistani children spent more time travelling by car than the less affluent urban or rural children on any day of the week. Also more than British Pakistani children on week days, but not week ends, most probably because of travelling to school by car or van by the affluent Pakistani children.

- ***Dressing, eating.***

Two relatively minor (but significant) differences noted were in the time spent in eating and dressing.

For the three groups of children in Pakistan the mean time spent in dressing was not different for the three days whereas British Pakistani children spent considerably less time on these activities on week ends.

An interesting thing to note is that while all the three groups of Pakistani children in Pakistan spent more time in eating on week ends it was not so for British Pakistani children.

- ***Housework***

Differences in time spent in housework was significant on all the three days. Rural Pakistani children always spent more time in housework than the affluent or less affluent urban or British Pakistani children. Excluding the affluent Pakistanis, the other three groups, rural Pakistani, less affluent and British Pakistani spent more time in housework on week ends than they did on week days.

- ***Outing (Walking)***

This included all activities involving walking e.g. going for a walk, walking to school, going to the park etc.
Rural Pakistani and less affluent Pakistani children on average walked more than the affluent urban Pakistani children in Pakistan and British Pakistani children in UK.

- ***Play***

This included various play activities including those undertaken during physical education (PE) classes. The play and exercise activities were categorised according to physical activity ratio, regardless of where they were undertaken. Differences in simple play activities which included catch, tug etc. were not significant but time spent in games like cricket, football etc. was significantly higher for affluent Pakistani and British Pakistani children as compared to less affluent and rural Pakistani children. This difference however was not significant on week ends because children from rural and less affluent and affluent urban background played more of these games on week ends, but for British Pakistani children, the mean time spent on these games was similar on all the three days.

- ***Praying***

On average rural Pakistani children spent more time in religious activities than the affluent or less affluent urban children and the British Pakistani children were more like rural children than urban ones in this respect. They were however different from the rural Pakistanis for whom time spent in praying did not vary much between the three days whereas British Pakistani spent less time in praying on week ends. The reason most probably is that the week end was Friday for Pakistani children in Pakistan and Saturday or Sunday for British Pakistani children. It may be noted that among Pakistani children in Pakistan mean time spent in praying on week ends was the same or slightly more than that on week days.

- ***Studying at home.***

Both the urban groups of Pakistani children spent more time studying at home than the rural children. British Pakistani children spent less time in studying at home than any group of Pakistani children in Pakistan and the reason seems to be related to school timings which are shorter in Pakistan as compared to the UK.

- ***Studying at school***

As mentioned above school timings in Pakistan are usually from 8 to 12: 30 as compared to 9 to 3: 30 in UK so the time spent in studying at school was significantly higher for British Pakistani children.

- ***Sitting.***

It included sitting talking, or just sitting etc. British Pakistani children spent much less time sitting talking than any group of Pakistani children. Rural Pakistani children spent more time sitting talking than British Pakistani children, but less than the affluent or less affluent urban Pakistani children.

- ***Watching TV***

British Pakistani children spent significantly more time in watching TV, both on weekdays and week ends, than the three groups of children in Pakistan.

Table 5-8: Mean Time (in hrs.) Spent in Various Activities By Each Group Of Children On Weekdays (from diaries)

Activities	p (UK3)	p (PK4)	Group					
			RrP	LaP	AfP	BrP	BrC	BrI
			Mean	Mean	Mean	Mean	Mean	Mean
			n 50	n 85	n=57	n=109	n=27	n=59
In Bed	****	ns	9.6	9.1	8.9	9.8	9.8	9.8
Car	****	ns	0.0	0.2	0.9	0.5	0.5	0.5
Dress	ns	ns	1.2	1.1	1.2	1.1	0.9	1.0
Eat	ns	ns	1.2	1.3	1.3	1.4	1.3	1.4
Housework	****	ns	1.9	1.2	0.6	0.5	0.4	0.4
Outing/Walking	****	ns	1.1	0.9	0.6	0.7	0.8	0.6
Play (Least Active)	*	ns	0.4	0.5	0.6	0.4	0.6	0.5
Play (Moderately Active)	ns	*	0.3	0.3	0.4	0.3	0.3	0.4
Play (Active)	****	ns	0.1	0.0	0.3	0.3	0.4	0.3
Pray	*	****	0.4	0.2	0.2	0.4	0.0	0.0
Study (Home)	****	ns	1.6	2.4	2.4	1.1	0.8	1.1
Study (School)	****	ns	3.7	3.9	3.6	4.8	4.8	4.7
Sit (For Fun, Talking)	****	ns	0.8	0.9	1.0	0.4	0.5	0.5
TV	*	ns	0.7	0.7	0.8	1.0	1.3	1.2
Visiting	ns		0.1	0.0	0.1	0.1	0.2	0.1

*=P<0.05, ***=P<0.0005, ****=P<0.00005

Table 5-9: Mean Time (in hrs.) Spent in Various Activities By Each Group Of Children On Weekends (from diaries)

Activities	Group							
	Significance		RrP	LaP	AfP	BrP	BrC	BrI
	p (UK3)	p (PK4)	Mean	Mean	Mean	Mean	Mean	Mean
			n 50	n 85	n 57	n 109	n-27	n-59
In Bed	ns	*	10.0	11.0	11.0	11.0	11.0	11.0
Car	ns	**	0.3	0.3	0.5	0.5	0.5	0.6
Dress	ns	*	1.0	1.2	1.1	0.8	0.8	0.9
Eat	ns	*	1.4	1.7	1.7	1.4	1.1	1.3
Housework	ns	****	2.7	1.9	0.7	1.5	1.8	1.2
Outing/Walking	ns	*	0.9	0.7	0.8	0.3	0.8	0.2
Play (Least Active)	ns	ns	0.6	0.5	0.4	0.7	1.1	0.6
Play (Moderately Active)	ns	ns	0.2	0.3	0.4	0.3	0.5	0.5
Play (Active)	ns	ns	0.3	0.1	0.5	0.3	0.3	0.3
Pray	ns	***	0.4	0.3	0.3	0.2	0.0	0.1
Study (Home)	**	ns	1.8	1.5	1.9	1.5	0.6	1.6
Sit (For Fun, Talking)	ns	*	1.0	1.2	1.3	0.8	0.7	0.8
TV	ns	**	3.1	2.9	3.0	4.1	4.6	4.0
Visiting	ns	*	0.1	0.3	0.5	0.4	0.4	0.5

*=P<0.05, **-P<0.005, ***-P<0.0005, ****-P<0.00005

5.3 Physical Activity Level of the subjects

The three groups of children studied in UK did not differ significantly from each other in terms of Physical Activity Level. Boys from all the three groups had higher Physical Activity Level (mean PAR=1.28-1.31) than the girls (mean PAR=1.24-1.30). It is interesting to note that while the three groups of British boys had similar mean Physical Activity Level, the British Pakistani girls appeared to be the least active (mean PAR 1.24) and the British Caucasian girls to be the most active (mean PAR=1.26). This indication is supported by the fact that the difference in mean Physical Activity Level of boys and girls (average for whole week) was statistically significant ($p<0.001$) between British Pakistani boys and girls but not between British Indian or British Caucasian boys and girls.

Among the Pakistani children in Pakistan differences in Physical Activity Level of boys from the three groups were not statistically significant but they were among the girls. Rural Pakistani girls (mean PAR=1.30) were more active than both the groups of urban Pakistani girls (mean PAR=1.25 each). Both the groups of urban Pakistani girls however had a slightly higher Physical Activity Level than the British Pakistani girls (ns). Another interesting thing to note is that while the rural girls were more active than their urban counterparts $p<0.00001$) rural boys (mean PAR=1.28) tended to be less active than their urban age mates (mean PAR=1.31) (ns).

These PAR values are comparatively lower than presented by Torun (1996) for Phillipino boys and girls on the basis of data collected from 25 10-12 year old boys and 24 13-15 year old girls by Guzman et al (1991). For the Philipino boys and girls PAL was calculated to be 1.61 and 1.33 respectively. Information about time spent in various activities was collected by observation during daytime and diary or recall interview at night in these studies.

Table 5-10: Mean Daily Physical Activity Ratio Of Boys And Girls On Weekdays And Week Ends According To Group

Mean Physical Activity Ratio Of Boys And Girls From Different Groups								
	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
GIRLS			n=33	n=51	n=39	n=61	n=15	n=36
week days	ns	****	1.30	1.25**	1.26*	1.24**	1.25	1.24*
week ends	ns	***	1.31	1.26***	1.228	1.24	1.27	1.27
week average	ns	****	1.30	1.25*****	1.25**	1.24**	1.26	1.25
BOYS			n=17	n=34	n=18	n=28	n=12	n=32
week days	ns	*	1.27	1.30	1.32	1.28	1.27	1.29
week ends	ns	ns	1.31	1.34	1.30	1.27	1.32	1.27
week average	ns	ns	1.28	1.31	1.31	1.28	1.28	1.28

Bold letters indicate within group significant difference between boys and girls

*=P<0.05, **=P<0.005, ***=P<0.0005, ****=P<0.00005

Table 5-11: Mean Daily Physical Activity Ratio On Weekdays And Week Ends According To Group

Mean Physical Activity Level Of Six Groups Of Children								
	p (UK3)	p (PK4)	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
			RrP	LaP	AfP	BrP	BrC	BrI
			n=50	n=85	n=57	n=109	n=27	n=59
Week Days	ns	*	1.29 0.05	1.27 0.07	1.28 0.09	1.25 0.07	1.26 0.05	1.26 0.07
Week Ends	ns	***	1.31 0.10	1.29 0.13	1.25 0.12	1.25 0.10	1.29 0.15	1.27 0.17
Week Average	ns	**	1.29 0.05	1.28 0.07	1.27 0.08	1.25 0.06	1.27 0.06	1.26 0.08

*=P<0.05, **=P<0.005, ***=P<0.0005, ****=P<0.00005

5.4 Total Energy Expenditure

Among the three groups of British children differences in total energy expenditure were not statistically significant. Among the four groups of Pakistani children the rural Pakistani girls and boys had significantly lower total energy expenditure on both week days and week ends than the other three groups. The reason for rural children having significantly lower total energy expenditure in spite of having higher Physical Activity Level is that the calculation of total energy expenditure takes into account weight of the subjects and mean weight was significantly lower for rural boys and girls as compared to other Pakistani groups.

Table 5-16: Mean Energy Expenditure Per Day (in KJ) Of Girls And Boys According To Group

	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
GIRLS			n=33	n=51	n=39	n=61	n=15	n=36
week days	ns	*	6113	6241	6259	6404	6909	6466
week ends	ns	*	6025	6206	6470	6414	6792	6309
week average	ns	ns	6050	6216	6410	6411	6826	6354
BOYS			n=17	n=34	n=18	n=28	n=12	n=23
week days	ns	****	6354	7086	7461	7036	7129	7421
week ends	ns	*	6180	6843	7506	7109	7152	7492
week average	ns	****	6230	6912	7493	7088	7145	7472

*=p<0.05, ****=p<0.00005

5.5 Parent's Activity Habits As A Child In Comparison To Their Children.

The majority of parents (nearly half) from each of the six groups indicated that as a child their activity level was the **same** as their children. However UK parents (32-37%) were more likely than the Pakistani parents to say that they had been more active as children than their child. Nearly one third of parents from each of the Pakistani groups indicated that they had been less active than their children.

Between the three UK groups there was no significant difference in the percentage of parents who were less active than their children (34% BrP, 32% BrC and 37% BrI). Between the four Pakistani groups however the percentage of parents who indicated being less active was significantly higher (48%) among the affluent Pakistani than the other three groups (33% RrP, 38% LaP & 34% BrP).

Television seems to be a universal factor causing change in physical activities as all the six groups of parents indicated watching less television. None of the parents from the British groups, but all the three groups of parents from Pakistan indicated studying less often than their children. British parents (besides watching television) indicated spending less time in certain specific sports activities. Activities undertaken more often by all the three groups of British parents was walking, other such activities being running and housework for British Pakistani, running and going on outings for British Caucasian and housework and skipping for British Indian parents. Among the three groups of parents in Pakistan, activities undertaken more often by parents included, working on the farm, housework and playing outside by each of the three groups.

Table 5-17: Parents' Childhood Level Of Activeness According To Group

	Group						significance	
	RrP	LaP	AfP	BrP	BrC	BrI	p(uk3)	p(uk4)
	%	%	%	%	%	%		
	n= 73	n= 113	n= 94	n= 112	n= 30	n= 72		
Were You More Or Less Active Than Your Son/Daughter?							ns	****
◊ more	13	8	4	34	32	37		
◊ less	33	38	48	21	18	11		
◊ same	54	54	48	45	50	53		

****=P<0.00005

Table 5-18: Activities Undertaken More And Less Often By Parents in Their Childhood Than Their Children According To Group

	Rural Pakistani	Less Affluent Pakistani	Affluent Pakistani	British Pakistani	British Caucasian	British Indian
Activities Done Less Often By Parent	TV Eating Studying	TV Studying	TV Home Work	TV Sports Football	TV Swimming Gym	TV Swimming Sports
Activities Done More Often By Parent	Farm work Playing Housework	Housework Buying Grocery Farm work	Housework Play outside Animal care	Walking Running Housework	Walking Running Outing	Walking Housework Skipping

5.6 Discussion:

Asian adults are found to be physically less active than Caucasian men (Smith et al 1993, Shaukat et al 1995). This lower physical activity level of South Asians in UK is thought to be associated with higher waist-hip ratio, glucose intolerance and higher CHD mortality (McKeigue et al 1991). In a comparison of white and South Asian children, South Asian boys and girls were found to be participating less frequently in sports activities outside school sports lessons (Thomas et al, 1996). However in this study Asian children, with the exception of cricket in boys, were not significantly different from their Caucasian age-mates in their mean Physical Activity Level. However the low Physical Activity Level of British Pakistani girls is a cause of concern.

The Physical Activity Level of British Pakistani children was significantly lower than that of any group of children in Pakistan. Among the four groups of Pakistani children Rural Pakistani children had the highest Physical Activity Level. Rural girls were more active than boys whereas in urban area boys were more active. A generally low level of Physical Activity Level of Pakistani girls in urban areas points out towards the need for providing opportunities for active physical play for them. Particularly for urban girls for whom energy expenditure on housework is likely to decrease with increasing socio-economic status and diet likely to become richer in terms of fat and calories, there must be an increase in recreational physical activities to safeguard against the ill effects of positive energy balance.

6. KNOWLEDGE AND BELIEFS REGARDING CHD RISK FACTORS

This chapter describes differences in children's and their parents' views towards CHD risk factors.

6.1 Factors Affecting Children's Food Choice

6.1.1 Factors considered by children while making food choices

- ***British children***

Adolescence is a very important age not just in terms of physical development but also in relation to long term internalisation of extrinsic influences, including those originating from parents, religion, school and media. No doubt there are cultural and individual differences in the age at which any particular child or adult would start making truly independent choices. At the age of the children studied, the process of internalisation is usually not complete. So there still seems some room for intervention and it is valuable to have an understanding of the interaction or relative influence of various factors on the food choices of different groups of children.

In the questionnaires given to children there was a series of eight questions asking them how often they considered certain factors while making food choices. The factors covered were: price of food, religion, health, mother's food preferences for the child, father's food preferences for the child, friends' food choices, taste of food and appearance of food. The responses were to be checked against a five point ranking scale, ranging from never to always. Only one point was to be checked for each factor.

Among the children in the UK the relative importance of various factors was in most cases quite different in each group. Religion was the most important factor considered by the British Pakistani children. Caucasian children thought about religion least often. For Caucasian and British Indian children, taste was the factor which was given most importance. The appearance to food was more important to Pakistani children than it was for Caucasian or British Indian children. Pakistani and Indian children attached more importance to what their parents wanted them to eat than Caucasian children. Indian children gave more importance to health than did Caucasian or Pakistani children.

Table 6-1: Mean Rank Of Factors Considered By Children While Making Food Choices According To Group

Mean Rank Of Factors Considered By Children While Making Food Choices								
	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
Food's Price	ns	ns	2.5	2.5	2.6	2.4	2.7	2.3
Religion	****	****	3.3	3.6	4.0	4.5	1.6	3.0
Own Health	ns	****	3.3	3.4	3.5	2.5	2.6	2.8
Mother's Preferences	ns	****	3.3	3.7	3.6	2.7	2.3	2.7
Father's Preferences	*	****	3.1	3.7	3.5	2.7	1.8	2.4
Friend's Choices	ns	*	2.1	2.2	2.1	1.7	1.4	1.5
Food's Taste	**	****	3.3	3.6	4.0	3.4	3.9	4.2
Food's Appearance	ns	ns	2.9	3.1	3.1	3.1	2.4	2.8

*=P<0.05, **=P<0.005, ****=P<0.00005

Table 6-2: Rank Order Of Factors Considered By Children While Making Food Choices According To Group

	RrP	LaP	AfP	BrP	BrC	BrI
1st	religion/ health/ mother's preference/ taste	mother/ father's preference	taste/ religion	religion	taste	taste
2	father's preference	taste/ religion	mother's preference	taste	price	religion
3	food's appearance	health	father's preference/ health	food's appearance	health	health/ food's appearance
4	price	food's appearance	food's appearance	father's/ mother's preference	food's appearance	
5	friend's choices	price	price	health	mother's preference	mother's preference
6		friend's choices	friend's choices	price	father's preference	father's preference
7				friend's choices	religion	food's price
8					friend's choices	friend's choices

- ***Pakistani children***

Pakistani children in Pakistan mentioned considering religion while selecting food less often than did the British Pakistani children. The reason probably is that they do not have to. Whatever is available is allowed and things prohibited by religion are usually not commonly available. So they do not have to worry about it. According to their responses the Pakistani children in Pakistan attached much more importance to their health, parents' food preferences and friends' choices than the British Pakistani children. Taste and appearance was almost as (or more) important for the three groups of Pakistani children in Pakistan as it was for British Pakistani children. Even though the relative importance appears to be similar, the results indicate that affluent Pakistani children were thinking about all of the factors more often than the less affluent and less affluent more often than the rural Pakistani children. It may be because with affluence children not only get exposed to a larger variety of food but also are more likely to get an opportunity to make independent choices.

6.1.2 Children's food likes and dislikes

- ***British children***

There were a wide variety of foods mentioned as liked or disliked by children. Among the British group chips and pizza were favoured by all the three groups, ice cream by both the Asian groups and burgers by the Caucasian children only. Beans and cheese were disliked by both the Asian groups whereas cabbage and meat were separately disliked by Indian and Pakistani children respectively. Caucasian children disliked Brussels sprouts, cabbage and fish. One thing which emerges from these responses is the tendency to dislike certain vegetables. The second thing is that Asian children might not be completely satisfied with what they are eating at school mid-day meals. Although they have their favourite foods like chips and pizza on the school mid-day meal menu; the majority of them are also eating baked beans on most weekdays at the school mid-day meal despite it being the most disliked food.

These responses also indicate the combined effect of exposure and cultural and religious restriction. Quite a few Pakistani children gave 'haram' meat as their disliked food, whereas some mentioned meat without any further description to be their most disliked food. It seems that some children might be averted to meat or might be having a misconception of its being bad in itself. This appears to link in with responses to the question about considering religion while selecting foods. It appears that for Pakistani children, religion is an important factor affecting not only actual selection but also their likes and dislikes.

Table 6-3: Foods Most Commonly Liked And Disliked By Children in Each Group

Group	Favourite Foods			Disliked foods		
	1st	2nd	3rd	1st	2nd	3rd
Rural Pakistani	Meat	Rice	Mango	Aubergine	Karela	Karela
Less Aff. Pakistani	Mango	Ice cream	Apple	Pumpkin	Aubergine	Aubergine
Affluent Pakistani	Chicken	Rice	Ice Cream	Tinda	Tinda	Pumpkin
British Pakistani	Chips	Pizza	Ice Cream	Beans	Cheese	Meat
British Caucasian	Chips	Pizza	Burger	Brussels sprouts.	Cabbage	Fish
British Indian	Pizza	Chips	Ice Cream	Cheese	Cabbage	Beans

- ***Pakistani children***

British Pakistani children's food likes and dislikes were different from the likes and dislikes of Pakistani children in Pakistan. The reason for this difference is probably difference in exposure to various foods. For instance British Pakistani children often mentioned chips and pizza as their favourite foods while these foods are unknown to most of the Pakistani children.

6.1.3 The major influence on food choice at home

Parents and children separately in their own questionnaires were asked to mention whose likes and dislikes are given most importance when food choices are being made at home. The percentage responses of parents and children are presented in fig 6-1 and 6-2.

- ***Comparison of the three groups of British children***

According to *parents* responses, within the UK groups, British families considered everyone's likes and dislikes more often than the Indian or British Pakistani families. This view coincided with the *children's* view as far as relative frequency of children who checked this option is concerned. The percentage of *children* who thought that in their families everyone's likes and dislikes are given importance was lower than that of *parents* in all the three groups.

Fathers' and sons' food preferences were given importance less often in the British Caucasian family as compared to British Pakistani or British Indian families. Sons' food choices were given importance most often among the British Indian families and this was shown in *parents'* as well as *children's* responses. In both the cases nearly 27% of British Indian families gave most importance to sons' food choices. According to *parents* responses British Caucasian mothers had more influence on family food selection as compared to British Indian or British Pakistani mothers. But this view was not similarly shared by children. The percentage of British Caucasian children (25%) who thought that mother's food likes and dislikes are considered most important at home was similar to that of British Indian children (24%) and markedly lower than that of British Pakistani children (37%).

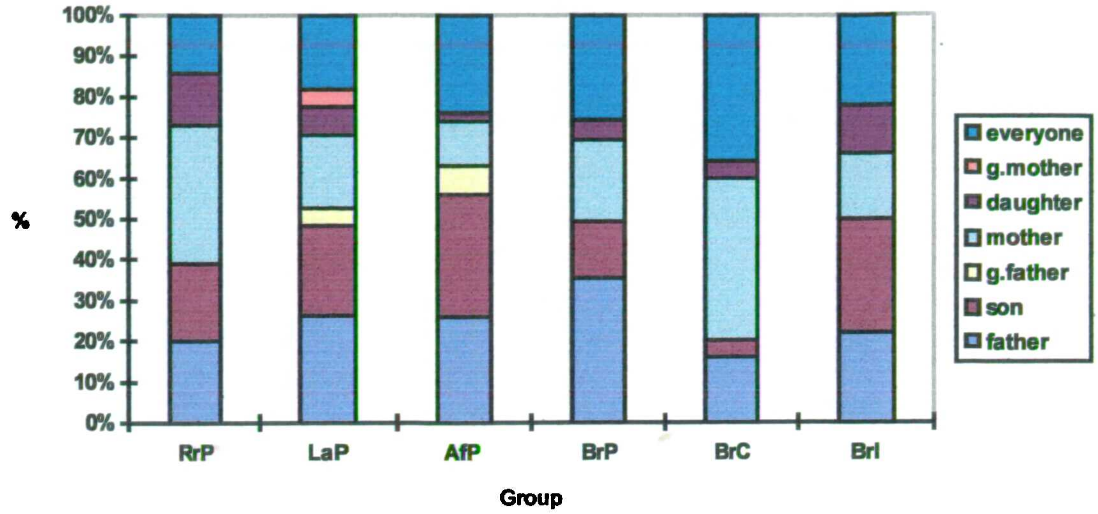
- ***Comparison of the British Pakistani children and Pakistani children in Pakistan***

According to *parents'* responses, British Pakistani families considered fathers' and everyone's choice more important than the Pakistani families in Pakistan in general did. Sons' choices were given least importance in British Pakistani families as compared to any group in Pakistan. Mothers' and daughters' influence in this regard seems to be more among British Pakistani families than that was in affluent urban families but was less than that in the rural families in Pakistan and was at the similar level as it was among the less affluent urban families.

- ***Comparison of the three groups of children in Pakistan***

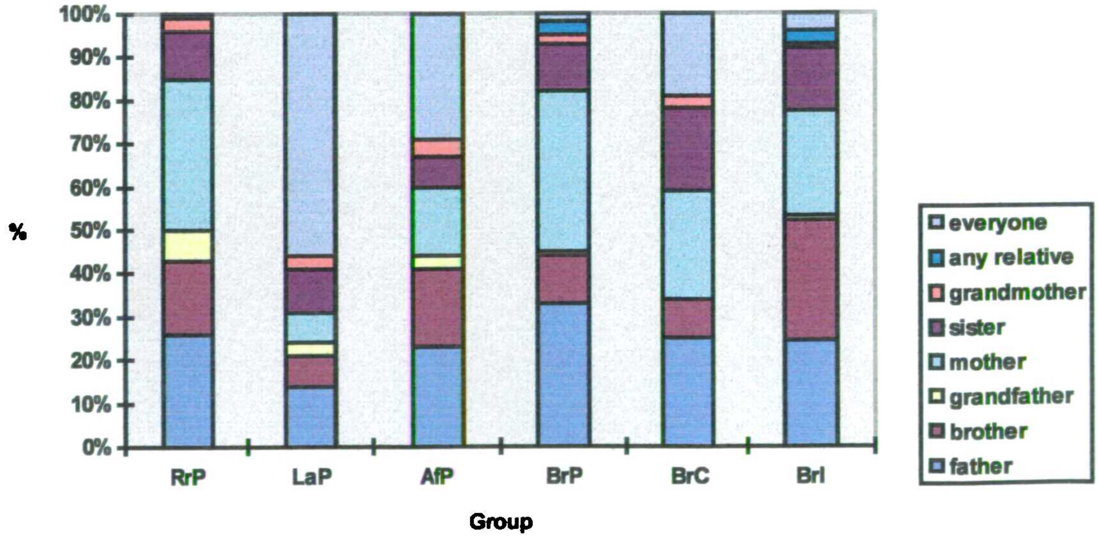
Pakistani children in Pakistan did not always have a similar view to that of their parents about who is considered most important in relation to food preferences. For instance among the less affluent Pakistani families nearly 50% of children but only 20% of parents thought that everyone is given importance while selecting foods. One observation which is consistent and interesting is that in rural families girls had more influence in this regard as compared to affluent or less affluent urban families, probably because they were more often cooking for the whole family and had more control of what is to be cooked and choices would be very limited anyway because of economic factors.

Figure 6-1: Percentage Of Parents Who Mentioned Any Family Member To Be Considered Most Important in Food Choice At Home According To Group*



* these figures are not corrected for the absence of fathers.

Figure 6-2: Percentage Of Children Who Mentioned Any Family Member To Be Considered Most Important in Food Choice At Home According To Group



* these figures are not corrected for the absence of fathers.

6.1.4 Beliefs about foods being especially good or bad for boys or girls.

Children's beliefs

There were four questions in the children's questionnaires about foods believed to be good or bad for boys and girls. The aim of these questions was to have information about which foods they think are good or bad for children of their age and whether they think different foods are good for boys and girls.

British Caucasian children more often than the two South Asian groups indicated that they do not think that any particular foods are especially good or bad for boys and girls.

In the Pakistani sample a higher proportion of rural children thought that some foods are especially good or bad for boys and girls.

- ***Comparison of British children***

Fruits and vegetables were in general considered to be good for boys and girls by all the three groups of children. The third most often mentioned food in this regard was milk for the Indian and Pakistani children and was salads for the British Caucasian children. Indian and Pakistani children mentioned milk to be especially good for boys but not for girls. It was replaced for girls with salads by British Indian and with lentils by British Pakistani children.

Chips, sweets and chocolates were the three foods most often mentioned as bad for boys and girls by British Indian and British Pakistani children. Caucasian children mentioned fatty foods instead of chocolates.

Table 6-4: Children's Views About Foods Which Are Good Or Bad For Boys According To Group

	Group						sign.	
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	%	%	%	%	%	%		
	n= 100	n 148	n= 159	n 110	n 34	n 72		
Any Foods Particularly Good For Boys							*	****
yes	26	12	21	11	18	15		
no	9	12	21	20	44	32		
don't know	65	77	58	69	38	52		
Any Foods Particularly Bad For Boys							ns	*
yes	10	8	15	18	18	23		
no	17	10	19	19	39	28		
don't know	73	82	66	64	42	49		

*=P<0.05, ****=P<0.00005

Table 6-5: Children's Views About Foods Which Are Good Or Bad For Girls According To Group

Children's Views About Foods Good Or Bad For Girls								
	Group						sign.	
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	%	%	%	%	%	%		
	n– 100	n– 148	n– 159	n 110	n– 34	n– 72		
Any Food Particularly Good For Girls							**	ns
yes	13	8	10	11	19	14		
no	11	16	22	24	50	36		
don't know	76	77	68	65	31	49		
Any Food Particularly Bad For Girls							ns	**
yes	8	6	10	18	21	20		
no	15	15	24	21	42	28		
don't know	77	79	66	61	36	52		

**=P<0.005

Table 6-6: Foods Most Often Mentioned To Be Good Or Bad For Boys and/or Girls By Children According To Group

	RrP	LaP	AfP	BrP	BrC	BrI
Foods Good for Boys and Girls	Meat Milk Rice	Fruit Milk Vegetables	Meat Milk Vegetable	Fruit Milk Vegetable	Fruit Salad Vegetable	Fruit Milk Vegetable
Foods Bad for Boys and Girls	Aubergine Beef Pumpkin	Toffees Fast foods Sweets	Okra Fatty foods Gourd	Chips Chocolates Sweets	Chips Fatty foods Sweets	Chips Fatty foods Sweets
Foods Especially Good for Boys	Meat Butter Milk	Fruits Vegetable Milk	Meat Vegetable Chicken	Fruit Vegetable Milk	Fruit Vegetable Salad	Fruits Vegetable Milk
Foods Especially Good for Girls	Orange Grapes Apples	Rice Eggs Apples	Chicken Spinach Nutritious	Fruit Vegetable Lentils	Fruit Vegetable Milk	Fruit Vegetable Salad
Foods Especially Bad for Boys	Pumpkin Beef Karela	Vendor foods Tamarind	Pumpkin Beef Karela	Sweets Chips Chocolates	Chips sweets Fats	Sweets Chips Chocolates
Foods Especially Bad for Girls	Beef Gourd Pumpkin	Tea Tamarind Vendor foods	Beef Fats Okra	Sweets Chocolate Chips	Sweet Fats Chips	Sweets Fats Chocolates

- ***Comparison of British Pakistani children and children in Pakistan***

British Pakistani children did not mention similar foods to be good or bad for boys or girls as were mentioned by any group of children in Pakistan. For instance no vegetables appeared in the list of three most commonly mentioned foods considered to be bad for either boys or girls by the British Pakistani group, while at least one vegetable appeared in this by affluent urban and rural Pakistani children. Similarly the tendency to mention sour foods as bad and meat as good, observed in the case of all the three groups of children in Pakistan was not found in the British Pakistani group.

- ***Comparison of the three groups of children in Pakistan***

Milk was mentioned as a good food for boys and girls by all the three groups of children in Pakistan. Rural and affluent Pakistani children thought that meat was good for boys and girls but at the same time beef also appeared among the three foods most often considered to be bad for boys. Another notable thing is that meat or milk does not appear in the list of three foods most often mentioned to be good for girls. It was replaced by fruits in the case of rural children and the less affluent and affluent urban thought that eggs and chicken are good for girls.

The frequency with which tamarind and other sour foods were mentioned may be linked to the general belief that they may be a causative or aggravating factor for throat irritation. Another belief about sour foods which is more prevalent among less educated groups, is that they promote female sex characteristics. So growing girls are recommended to refrain from eating it to prevent accelerated sexual development. On the other hand men and boys are not expected to have a preference for spicy and sour foods, probably because of the same reason. Although these ideas are not taken very seriously and most people will not acknowledge believing them, their presence cannot be denied.

Certain vegetables are considered to be 'hot' or 'cold' and their consumption during certain seasons and health conditions is disapproved. Some vegetables are considered less digestible and 'gas producing'. Aubergine is thought to be 'hot' as well as gas producing. As these views about vegetables are not always consistent among people belonging to different social and educational backgrounds, it is not certain why some particular vegetables like pumpkin, okra, gourd or karela were thought to be bad.

This concept of hot and cold foods refers not to the physical properties of the food, but to the effects these foods are believed to have in the body. This is found in many South Asian and South American cultures, as well as among ethnic Chinese and may effect people's selection of foods at particular stages of life(e.g. pregnancy) or in the management of disease (Fieldhouse 1995).

Parents' beliefs

Parents from different cultural and geographical backgrounds may not have exactly similar views about the foods they think to be good or bad for their children. Parents in this study were requested to answer a series of questions relating to their views about foods they consider to be especially good or bad for boys and girls.

Eighteen percent of British Pakistani, 9% of British Indian and only 3 % of British Caucasian parents ($p<0.05$) thought that any foods are particularly good for boys and girls. In the Pakistani sample the percentage of parents who thought that some foods are particularly good or bad for boys and girls fell from 39% among the rural group to 29% in less affluent and 22% in affluent urban group. It seems that beliefs about particular foods being good or bad for boys and girls decreases with education and/or westernisation.

There was little evidence of any gender specific ideas about good and bad foods. All parents in the UK irrespective of group, considered fruit, vegetables and milk to be good for boys as well as for girls. No specific pattern was evident from these responses except that both the groups of Asian parents mentioned egg to be good for boys but did not mention it for girls.

Views of British Pakistani parents however seem to be noticeably different from that of parents in Pakistan. Meat was considered to be good and sour foods to be bad for boys as well as for girls by all the three groups of parents in Pakistan but not by British Pakistani parents. Parents from the urban area of Pakistan also seem to be more concerned about the hygienic quality of food. It was mentioned in relation to foods bad for boys and for girls. It is interesting that while the rural Pakistani children had most frequent consumption of tea among the three Pakistani groups in Pakistan, their parents thought it to be bad for boys as well as for girls. Another exceptional view of rural Pakistani parents was that they thought 'hot foods' to be bad for girls.

Table 6-7: Parents' View About Foods Good Or Bad For Children According To Group.

	Group						sign.	
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	n 73	n 113	n 94	n 112	n 30	n– 72		
	%	%	%	%	%	%		
Different Foods Good For Boys And Girls?							**	****
yes	39	29	22	18	3	9		
no	18	25	53	48	83	51		
don't know	44	46	25	34	14	40		

**=P<0 005, ****=P<0 00005

Table 6-8: Parents' View About Foods Good Or Bad For Boys According To Group

	Group						sign.	
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	%	%	%	%	%	%		
	n= 73	n 113	n 94	n= 112	n= 30	n– 72		
Any Foods Particularly Good For Boys							ns	****
yes	40	37	44	21	18	22		
no	16	14	27	36	59	38		
don't know	43	49	29	43	24	40		
Any Foods Particularly Bad For Boys							.03	**
yes	31	20	32	24	32	36		
no	17	15	28	33	47	24		
don't know	52	65	40	44	21	40		

**=P<0.005, ****=P<0.00005

Table 6-9: Parents' View About Foods Good Or Bad For Girls According To Group

	Group						sign.	
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
	%	%	%	%	%	%		
	n= 73	n 113	n– 94	n 112	n– 30	n– 72		
Any Food Particularly Good For Girls							ns	**
yes	37	27	29	18	29	21		
no	14	18	33	37	46	36		
don't know	49	55	38	45	26	44		
Any Food Particularly Bad For Girls							**	***
yes	30	19	29	16	29	34		
no	14	20	31	36	47	22		
don't know	56	62	39	49	24	44		

**=P<0.005, ***=P<0.0005

Table 6-10: Foods Which Are Considered To Be Good Or Bad For Boys and/or Girls By Parents According To Group

	GROUP					
	Rural Pakistani	Less Affluent Pakistani	Affluent Pakistani	British Pakistani	British Caucasian	British Indian
Foods Especially Good For Boys	Meat Milk Fish	Meat Milk Frt. & Veg.	Meat Milk Veg	Eggs Milk Frt. & Veg.	Vegetable Milk Fruit	Eggs Milk Frt. & Veg
Foods Especially Bad For Boys	Sour Tea Sweets	Sour Unhygienic Spicy	Sour Unhygienic Eggs	Fats Chips Sweets	Fatty Fried Sweets	Fatty Chips Chocolate
Foods Especially Good For Girls	Meat Milk Vegetable	Meat Milk Vegetable	Meat Milk Fruit	Fruit Milk Vegetable	Fruit Milk Vegetable	Fruit Milk Vegetable
Foods Especially Bad For Girls	Sour Tea Hot Foods	Sour Foods Unhygienic Spicy Foods	Sour Foods Unhygienic Spicy	Fatty Foods Sweet/Choc Chips	Fatty Foods Sweet Red Meat	Fatty Foods Sweet Chocolate

6.1.5 Cardiovascular nutrition knowledge

- ***Comparison of British children***

No child achieved the maximum possible score of 24. There was no significant difference between the mean scores achieved. Scores ranged from 8 to 22 for BrP, 10-22 for BrC and 6-21 for BrI children. Not all questions were answered equally well. Questions about fibre were answered better than those about fats. In general the responses indicate that most of the children had good awareness of the risk factors but were less well informed about specific food related preventive strategies.

Although the mean total score was not very different for the three groups the pattern of responses was different in some areas. Significantly fewer Caucasian children as compared to Pakistani or Indian children thought that margarine is better than butter for cardiovascular health and also that smoking is a risk for heart disease. A significantly higher proportion of Pakistani children as compared to Caucasian and Indian children thought that bread, potato and pasta are fattening foods. (These instances may not be adequate to make any generalisation but it indicates that different areas of knowledge may need to specified.)

- ***Comparison of British Pakistani children and Pakistani children in Pakistan.***

British Pakistani children had a significantly higher total mean knowledge score than any group of Pakistani children in Pakistan.

Most of the questions were answered correctly more often by the British Pakistani children in comparison to Pakistani children in Pakistan. But there were instances where affluent urban children or all the three Pakistani groups in Pakistan did almost as well as or better than British Pakistani children. Those questions included considering too much stress a risk, eating vegetables not a risk, not considering hard work to be a risk, considering lack of exercise a risk, knowing that fibre is not obtained from animal sources, considering saturated fats not to be good for health, ghee contains saturated fats.

- ***Comparison of the three groups of children in Pakistan.***

The total mean score was highest for affluent Pakistani and lowest for rural Pakistani children with less affluent being intermediate. The difference was statistically significant between the affluent urban and rural Pakistani group. Most of the questions were answered correctly more often by the affluent and less affluent urban children than by the rural children.

Table 6-11: Cardiovascular Nutrition Knowledge According To Group

	GROUP							
	RrP	LaP	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
Mean	12.6	14.0	14.2	16.0	16.0	15. 7	ns	***
Minimum	6.0	6.0	8.0	7.0	10.0	6.0		
Maximum	19.0	23.0	22.0	23.0	22.0	21.0		
Std deviation	2.91	2.82	2. 89	3.33	3.45	3.28		

***=$p<0.0005$

Table 6-12: Percentage Of Children Who Gave Correct Answers According To Group

Questions	Groups						Significance	
	RrP	LaF	AfP	BrP	BrC	BrI	p (UK3)	p (PK4)
Which One Is A Better Choice For Protecting Ourselves From Heart Disease?								
Apple/Apple Pie[1]	72	48	78	99	91	95	.ns	****
Whole Milk/Sk. Milk	27	43	46	47	63	64.	ns	ns
Butter/P.U Margarine	18	41	32	86	63	73.	*	****
Which Of The Following May increase A Person's Risk Of Having A Heart Attack?								
Too Much Stress	56	74	89	88	74	84.	ns	****
Eating Vegetables	87	86	98	95	94	98.	ns	***
Smoking Cigarettes	87	89	93	97	88	100	**	*
Hard Work	62	64	60	43	55	53	ns	*
Eating Too Much Fat	24	61	70	92	82	91	ns	****
Being Overweight	41	56	58	79	69	62	ns	****
Lack Of Exercise	35	60	65	54	68	55	ns	****
Drinking Tea	38	60	58	87	91	92	ns	****
Are The Following Statements True Or False?								
Bread, Potato And Pasta Are Fattening	68	26	28	55	81	76	**	****
Butter Contains More Calories Than Margarine	39	34	29	33	31	20	ns	ns
Weight For Weight Fat Contains More Calories Than Carbohydrates	72	52	45	66	56	54	ns	***
Fibre Is Obtained Both From Animal And Vegetable Foods	32	42	56	35	58	44	ns	***
Fibre Is Lost During Cooking	35	36	32	61	60	64	ns	****
Amount Of Fibre in The Diet Can Be increased By Adding Fruits.	60	54	46	81	79	84	ns	****
Which Of The Following Fats Is Not Good For Health?								
Saturated/Polyunsaturated	64	61	73	37	38	26	ns	****
Which Of The Following Contains Saturated Fats?								
Whole Milk	65	33	21	55	58	40	ns	****
Cheddar Cheese	39	56	64	65	50	63	ns	***
Corn Oil	68	58	58	47	47	51	ns	*
Cod Liver Oil	63	52	28	40	53	50	ns	****
Sunflower Oil	58	53	61	52	41	46	ns	ns
Lard	48	82	84	63	70	63	ns	****
Ghee	60	69	69	71	50	68	ns	ns
Dairy Cream	56	60	52	65	64	74	ns	ns
Which Of The Following Is The Biggest Source Of Fat Amongst People Your Age?								
Biscuits	5	1	1				ns	****
Chips	1	5	2	78	88	88		
Curry	19	22	14					
Paratha	6	24	23					
Milk	13	7	2					
Ice Cream	2	3	1					
Sweetmeats	10	23	26					

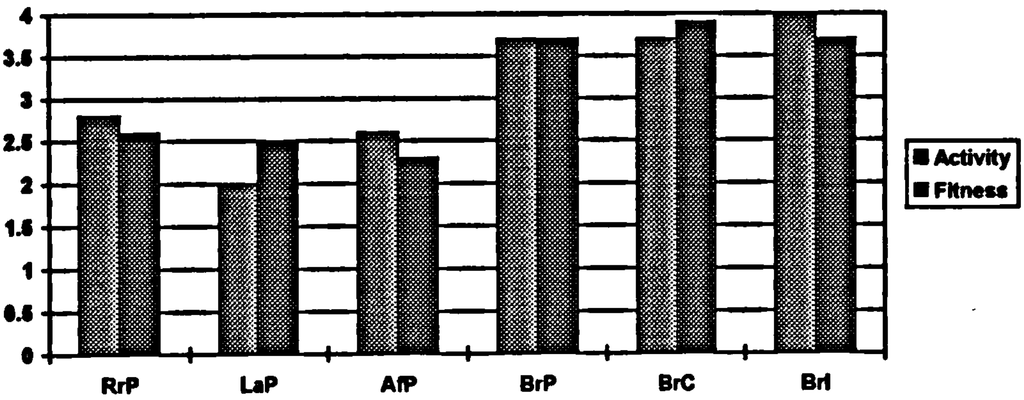
[1]replaced by carrot/carrot halwa for questionnaires in Pakistan
*=P<0 05, **=P<0.005, ***=P<0.0005, ****=P<0 00005

6.2 Concern with Fitness, Weight and Health

6.2.1 Self assessment of activenesss and fitness

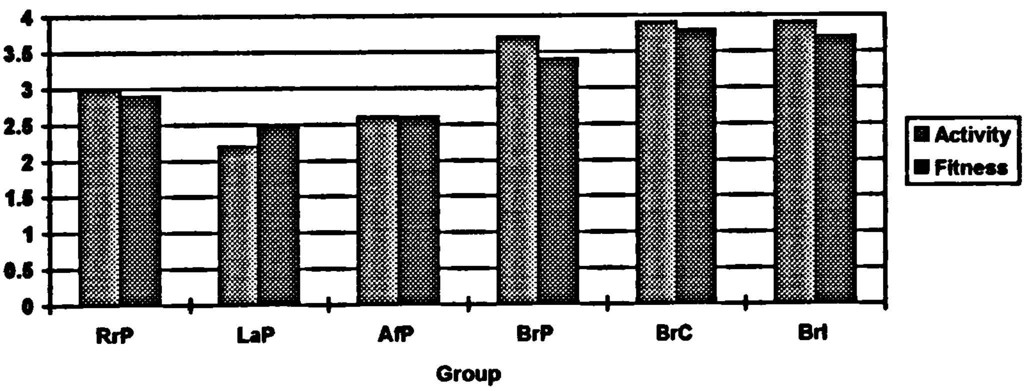
The three groups of children from the UK were not significantly different from each other in their self assessment of activeness or fitness. On the other hand the differences were highly significant between the four Pakistani groups. British Pakistani children thought themselves to be at a higher level of activeness and fitness than did any group of Pakistani children in Pakistan. Within the Pakistani children in Pakistan, rural children in general considered themselves to be more active and fit than did either the affluent or less affluent urban children. The differences in the assessment of fitness was not significant between the two urban Pakistani groups but a significantly higher percentage of less affluent Pakistani children considered themselves to be inactive than did the affluent urban Pakistani children. (see figure 6-3, 6-4)

Figure 6-3: Mean Rank* For Self Assessment Of Activity And Fitness (Boys) According To Group



* lower mean rank indicates lower level of self assessed activity or fitness level (0=very unfit or very inactive)

Figure 6-4: Mean Rank* For Self Assessment Of Activity And Fitness (Girls) According To Group



* lower mean rank indicates lower level of self assessed activity or fitness level (0=very unfit or very inactive)

6.2.2 Self assessment of activenesss and fitness vs actual

No significant relationship was seen in any group between children's self assessment of Physical Activity Level and their actual Physical Activity Level. Neither was their any significant difference in mean time spent in various activities by children thinking themselves to be more or less active.

However among Rural Pakistani girls and British Caucasian girls those who thought themselves to be more fit had significantly higher Physical Activity Level than those who viewed themselves as less fit. In all other children there was no association found between their self assessment of fitness and their Physical Activity Level.

No consistent relationship was observed between children's self assessed level of fitness and self assessment of activity. Only in rural Pakistani boys, affluent Pakistani girls and boys and British Caucasian girls there was a significant relationship positive relationship between assessment of activity and fitness ($p<0.01$ in each case).

These results indicate that in general children's self assessed level of activity or fitness is not associated with their Physical Activity Level. The reason for this may be lack of understanding about relative energy costs of various activities and lack of ability to assess actual time spent in various activities. The inter group differences in these associations show that children differ in their ability to assess their activity and fitness level.

Table 6-13: Children's Mean Physical Activity Level According To Their Self Assessed Level Of Fitness And Group

Physical Activity Level	Self Assessed Of Fitness											
	RrP		LaP		AfP		BrP		BrC		BrI	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
	%	%	%	%	%	%	%	%	%	%	%	%
Weekdays												
Girls	n-4	n=19	n-29	n-32	n 16	n-23	n-15	n-46	n=3	n-12	n-5	n=31
Low	0	48	72	50	71	61	50	67	**50**	67	100	50
High	100	52	28	50	29	39	50	33	**50**	**33**	0	50
Boys	n=6	n=11	n=17	n=17	n=7	n=11	n=3	n-25	n=1	n=11	n=3	n=20
Low	67	44	78	47	64	70	50	61	100	33	0	50
High	33	56	22	53	36	30	50	39	0	67	100	50
Average for whole week												
Girls	n-4	n=19	n-29	n-32	n 16	n=23	n=15	n=46	n-3	n-12	n=5	n=31
Low	60	70	0	17	38	36	0	30	100	27	57	45
High	40	30	100	83	63	64	100	70	0	73	43	55
Boys	n-6	n-11	n=17	n-17	n 7	n=11	n-3	n-25	n=1	n=11	n=3	n=20
Low	**60**	**50**	0	33	25	36	100	30	100	45	43	48
High	**40**	**50**	100	67	75	64	0	70	0	55	57	52

figures in bold indicate sign p<0.05

Table 6-14: Children's Mean Physical Activity Level According To Their Self Assessed Activity Level And Group

Physical Activity Level	Self Assessment Of Activity level											
	RrP		LaP		AfP		BrP		BrC		BrI	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
	%	%	%	%	%	%	%	%	%	%	%	%
Weekdays												
Girls	n 10	n-24	n 28	n=24	n 15	n-25	n-10	n 51	n-1	n=14	n=5	n-32
Low	33	45	59	52	64	70	57	62	100	60	50	54
High	67	55	41	48	36	30	43	38	0	40	50	46
Boys	n-7	n-11	n 22	n=12	n-5	n 13	n-3	n-26	n=2	n-10	n-2	n=21
Low	56	45	59	52	64	74	57	57	100	40	50	46
High	44	55	41	48	36	26	43	43	0	60	50	54
Week average												
Girls	n 10	n 24	n-28	n-24	n-15	n 25	n 10	n-51	n 1	n-14	n-5	n-32
Low	40	70	0	20	24	47	33	29	0	45	50	44
High	60	30	100	80	76	53	67	71	100	55	50	56
Boys	n-7	n 11	n-22	n-12	n 5	n 13	n 3	n-26	n-2	n-10	n=2	n-21
Low	20	60	17	20	18	42	33	33	50	55	50	47
High	80	40	83	80	82	58	67	67	50	45	50	53

Table 6-15: Children's Self Assessed Level Of Fitness According To Their Self Assessment Of Activity And Group

	Girls				Boys			
		Unfit	Mod. Fit	V.Fit		Unfit	Mod. Fit	V.Fit
RrP	no.	%	%	%	no.	%	%	%
Less active	26	63	18	21	14	58	26	17
Mod.Active	15	38	21	50	71	37	52	33
V.Active	22	0	9	29	14	5	22	50
LaP								
Less active	33	60	61	47	50	78	44	67
Mod.Active	28	36	31	53	0	17	56	27
V.Active	2	4	3	0	50	4	0	7
AfP								
Less active	27	68	38	20	17	69	17	0
Mod.Active	30	25	42	77	33	29	71	0
V.Active	6	7	8	3	50	2	12	100
BrP								
Less active	10	24	7	0	13	29	0	16
Mod.Active	6	18	7	67	2	29	100	10
V.Active	51	59	20	33	85	43	0	74
BrC								
Less active	2	33	3	0	7	50	0	17
Mod.Active	3	33	3	100	7	0	100	17
V.Active	14	33	9	0	87	50	0	67
BrI								
Less active	5	20	4	0	13	33	0	14
Mod.Active	2	0	2	25	3	0	50	0
V.Active	34	80	23	75	84	67	50	86

6.2.3 Self assessment of weight vs actual weight

Children seem to have a more realistic view of their body weight than they had of their Physical Activity Level. In all the six groups children who indicated a desire to lose weight had the highest mean BMI and those who wanted to gain weight had the lowest mean BMI. Excluding the rural children, in all the other groups the differences in mean BMI of children according to their willingness to gain or lose weight was statistically significantly ($p<0.0005$ in all cases).

Table 6-16: Mean BMI Of Children According To Self Description Of Body Weight And Group

	Mean BMI					
Self Description	RrP	LaP	AfP	BrP	BrC	BrI
	n 87	n 120	n 105	n=106	n 31	n=68
like to put on wt.	15	**15***	14	15	16	15
like to lose wt.	17	20	21	21	23	21
happy as it is.	16	16	16	17	17	17

*figures in bold indicate statistically significant ($p<0.0005$ in each case) intra group differences in BMI

6.2.4 Concern with body weight

- ***Desire to gain or lose weight***

Although the three British groups did not differ significantly in general in their views about their body weight, within each group the relative proportion of boys and girls who had any particular attitude towards their body weight was different. Among British Pakistani (40% g, 17%b) and British Caucasian groups a noticeably higher proportion of girls (37% g, 27%b) wanted to lose weight as compared to boys, while in the British Indian group a slightly higher proportion of boys wanted to lose weight (30% g, 37%b). Nearly 60 % of children were satisfied with their weight and about 10% from each group wanted to gain weight. An unexpected difference noted was that none of the British Caucasian boys but 16% of British Caucasian girls wanted to gain weight. In British Pakistani and British Indian groups boys (20 & 13% respectively) more often desired to gain weight than girls (6 & 9% respectively).

Within the four groups of Pakistani girls, affluent Pakistani and British Pakistani girls significantly ($p=0.0000$) more often (38 & 40%) indicated their desire to lose weight as compared to rural or less affluent Pakistani girls (15 & 14 % respectively). Among the boys the difference was less significant ($p=0.04$).

Children were also asked to indicate whether they were actually trying to gain or lose weight and if they did, what measures they were taking to achieve their goal. The three groups of British children were not significantly different from each other. Among the four groups of Pakistani children, the British Pakistani girls and boys least often (3 & 19%) and rural Pakistani most often (14 & 35 %) indicated that they were trying to gain weight. Among the boys the proportion of British Pakistani boys who were trying to lose weight (23%) was closer to less affluent (27%) urban or rural (26%) Pakistani boys and markedly (but not statistically significantly) higher than affluent Pakistani boys (12%).

Not all the children who mentioned being dissatisfied with their weight reported attempting to lose or gain weight. Only in the rural, affluent urban Pakistani and British Caucasian groups was the children's desire to gain weight strong enough to make them do something about it. A majority of those less affluent Pakistani, British Pakistani, British Caucasian and British Indian children who wished to lose weight reported making practical attempts to achieve their aim.

Table 6-17: Children's Views About Their Body Weight According To Group

		p (UK3)	p (PK4)	GROUP					
				RrP	LaP	AfP	BrP	BrC	BrI
				%	%	%	%	%	%
Self Description	girls boys	ns ns	*** *	n-52 n-50	n-65 n=85	n-70 n=92	n=68 n=43	n=19 n=15	n=43 n=30
like to put on wt.	girls boys			10 30	11 15	6 11	6 20	16 0	9 13
like to lose wt.	girls boys			15 16	14 23	38 14	40 17	37 27	30 37
happy as it is.	girls boys			75 55	75 62	56 75	54 61	47 73	60 50

*=p<0.0, ***=p<0.0005

Table 6-18: Percentage Of Children Who Were Trying To Gain Or Lose Weight According To Group

		P (PK4)	p (UK3)	GROUP					
				RrP	LaP	AfP	BrP	BrC	BrI
	girls boys			n=52 n=50	n=65 n=85	n=70 n=92	n=68 n=43	n=19 n=15	n=43 n=30
				%	%	%	%	%	%
Trying To Gain Wt	girls boys	ns *	ns ns	14 35	5 19	7 16	3 19	17 0	5 10
Trying To Lose Wt	girls boys	*** ns	ns ns	8 26	16 27	29 12	35 23	22 27	28 37

*=p<0.0, ***=p<0.0005

- ***Childrens' strategies for gaining or losing weight***

The number of children who specified what they were doing to gain or lose weight was too small for any statistical comparison to be made. The methods generally mentioned for gaining weight were eating more and exercise. Rural children also mentioned eating meat and vegetables, milk and butter. Foods which British Pakistani children were eating to gain weight included vegetable fat, chapati, chocolate and halal food. Measures undertaken by all the six groups of children to lose weight were dieting (eating less) and exercise only. The three British groups mentioned both dieting and exercise together, eating more fruit and vegetables, eating less chocolate and avoiding eggs.

6.2.5 Children's perceptions of their own health

A series of four questions were asked to obtain information about the children's concept of their control over their own health. The three groups of British children were not very different from each other in their responses to these questions. However some differences between the four Pakistani groups were noted. Rural Pakistani children less often agreed with the statement "I am incharge of my health" than did the urban Pakistani and British Pakistani children. Affluent Pakistani children disagreed with the statement "Even if I look after myself I may still fall ill" significantly more frequently than did either rural Pakistani, less affluent Pakistani or British Pakistani groups.

These questions were used to generate a health locus of control score (Balding, 1994). For the first and the third question where agreement indicated internal control over health, a score of 1 was given for agreement and -1 for disagreement. For the second and the fourth question where agreement indicated external control over health, an score of -1 was given for disagreement and 1 for agreement. For all the four questions 'not sure' was given a score of zero. The sum of all the four scores generated a locus of health control score for each child, which could range from -4 to +4. Lower scores, or more negative scores indicated that the child considered external factors to be responsible for their health.

Between the three British groups no statistically significant difference was noted. British Pakistani children had less negative scores than any group of Pakistani children and more positive scores than rural and less affluent Pakistani children. It seems that British Pakistani and affluent Pakistani boys and girls feel a greater degree of control with regards to health as compared to rural and less affluent boys and girls.

No consistent pattern of differences was noted between boys and girls within each group. Among less affluent Pakistani, British Pakistani and British Indian groups a higher percentage of boys had positive scores than girls, whereas among the affluent Pakistani group girls had more positive scores. None of the differences between boys and girls within each group was statistically significant.

Table 6-19: Children's Perception Of Control Over Their Health According To Group

		p (UK)	p (PK)	RrP	LaP	AfP	BrP	BrC	BrI
	girls			n=52	n=61	n=69	n=67	n=19	n=42
	boys			n=48	n=87	n=90	n=43	n=15	n=30
				%	%	%	%	%	%
I am in charge of my health	girls	ns	ns						
	boys	ns	ns						
not sure	girls			63	45	49	39	28	39
	boys			38	34	34	27	33	43
agree	girls			31	50	46	55	56	51
	boys			54	57	58	61	60	47
disagree	girls			6	5	4	6	17	10
	boys			8	9	8	11	7	10
If I keep healthy I have just been lucky	girls	ns	****						
	boys	*	****						
not sure	girls			36	50	49	25	47	43
	boys			16	33	49	48	53	13
agree	girls			58	43	36	42	21	29
	boys			78	49	35	29	20	37
disagree	girls			6	7	16	33	32	29
	boys			6	18	15	24	27	50
If I take care I'll stay healthy	girls	ns	ns						
	boys	*	ns						
not sure	girls			4	19	11	18	22	15
	boys			11	16	12	16	47	7
agree	girls			86	75	84	76	72	78
	boys			84	80	76	79	53	87
disagree	girls			10	5	4	6	6	7
	boys			4	4	12	5		7
Even if I look after myself I can still fall ill	girls	*	***						
	boys	ns	*						
not sure	girls			54	43	38	30	17	32
	boys			42	44	33	35	33	47
agree	girls			27	33	16	43	83	46
	boys			19	30	17	35	67	30
disagree	girls			19	25	46	27		22
	boys			40	26	50	30		23

$*=P<0.05$, $**=P<0.005$, $***=P<0.0005$, $****=P<0.00005$

Table 6-20: Health Locus Of Control Score According To Group

SCORE		p (UK)	p (PK)	GROUP					
				RrP	LaP	AfP	BrP	BrC	BrI
	girls	ns	*	n=52	n=61	n=69	n=67	n=19	n=42
	boys	ns	ns	n=48	n=87	n=90	n=43	n=15	n=30
				%	%	%	%	%	%
-4 to -2 (external control)	girls			9	6	4	3	5	2
	boys			6	6	4	2	7	0
-1 to 0	girls			51	38	27	38	47	38
	boys			45	35	25	30	40	43
1 to 2	girls			34	48	46	44	47	45
	boys			43	46	53	50	53	30
3 to 4 (Internal control)	girls			6	8	23	15	0	14
	boys			6	13	18	18	0	27

$*=P<0.05$

6.3 Smoking

6.3.1 Smoking intentions of children

Among the three groups of British children a significantly higher percentage of British Caucasian children (32% girls & 27% boys) indicated that they might start smoking when they grow older. Although the difference was not statistically significant among the boys the proportion of children who were actually smoking was higher among British Pakistanis (6% BrP vs 0% each BrC & BrI) and among the girls in British Caucasians (5% BrC vs 0% BrP & 0% BrI).

The three groups of Pakistani children in Pakistan were neither significantly different from each other, nor from the British Pakistani children in their smoking intentions smoking (table 6-21). However the percentage of boys who were actually smoking was least in rural and less affluent children (2% each) and comparatively higher in affluent urban boys (4%). This trend was unexpected in view of the higher rates of smoking among adults in rural and less affluent areas of Pakistan in general and also as have been reported in this sample. Probably affluent urban children were more independent in their attitude towards smoking.

Children's smoking intention was affected by the presence of a smoker in the family (table 6-22). In all the six groups a higher percentage of children from non smoker families indicated that they donot smoke and never would (fig 6.). The difference was statistically significant for rural Pakistani, less affluent Pakistani and British Pakistani children ($p<0.05$ in each case). For affluent Pakistani children the difference was not significant.

Table 6-21: Smoking Intentions Of Children According To Group

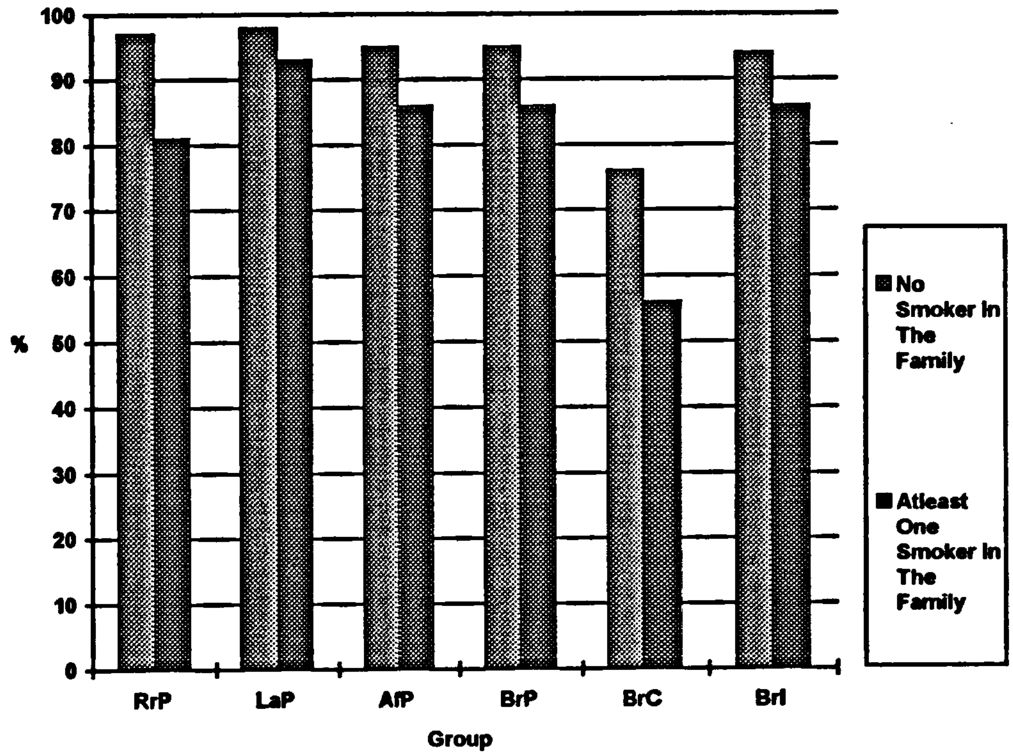
Smoking Intentions	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	G	B	G	B	G	B	G	B	G	B	G	B
	n=32	n-41	n-46	n-99	n-68	n 89	n-67	n-46	n 19	n=15	n-47	n 30
	%	%	%	%	%	%	%	%	%	%	%	%
don't smoke now and never will	94	83	94	98	96	90	93	89	63	73	91	97
don't now but may when older	6	15	6	0	4	6	7	4	32	27	9	3
smoke like to give up	0	2	0	2	0	3	0	2	5	0	0	0
smoke don't want to give up	0	0	0	0	0	1	0	4	0	0	0	0

Table 6-22: Children's Smoking Intentions According to the Presence Of A Smoker in Their Family And Group

Smoking Intentions	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	sm[i]	nsm[ii]	sm	nsm	sm	nsm	sm	nsm	sm	nsm	sm	nsm
	n 52	n-51	n-52	n-109	n-48	n 115	n-51	n 62	n=16	n=17	n-7	n-66
	%	%	%	%	%	%	%	%	%	%	%	%
don't smoke now and never will	97	81*	98	93*	95	86	95	86*	76	56	94	86
don't now but may when older	3	17	2	2	4	9	5	8	24	38	6	14
smoke like to give up	0	3	0	5	2	2	0	2	0	6	0	0
smoke don't want to give up	0	0	0	0	0	2	0	4	0	0	0	0

i=At least one Smoker in Family, ii=No smoker in family
*=sgin<.05 (Pearsons correlation)

Figure 6-5: Percentage Of Children Who Think They Would Never Smoke According To Presence Of At Least One Smoker in The Family And Group



6.3.2 Smoking among family members

Among the British children a significantly lower proportion of Indian children had a smoker in their family, compared to British Caucasian and British Pakistani children. Both of the latter groups were not markedly different from each other in this regard.

Among the Pakistani children in Pakistan, rural children most often (55%) and the affluent urban least often (30%) had a smoker in their family.

6.4 Discussion

The three British groups of children had very similar food likes and dislikes whereas food preferences of three group of children in Pakistan were not similar to the same extent. This indicates that probably economic factors have a strong influence. As also shown by other results of this study, religion had a very strong influence on British Pakistani children's eating habits and children themselves were aware of it. Children's views about foods being good for boys and girls were not significantly different between and within ethnic groups. Foods considered to be good or bad for boys or girls by any group of children were in most cases similar to the food considered to be good or bad for boys or girls by the parents from the relevant group. Although the differences were not consistent, there was a trend among South Asian parents and children to consider milk and meat good for boys as well as for girls more often than British Caucasian parents and children.
Relative influence of the head of the household or other members on family food choice was significantly different between groups with fathers having the greatest influence in British Pakistani families and mothers in British Caucasian families. Children's views generally did not coincide with the parents views in this regard. These findings have implications for health education. For some groups educating fathers and sons seems to by crucial.

The mean score for cardiovascular nutrition knowledge of the three British groups was similar, but within Pakistan it increased with socio-economic level and British Pakistani children had a significantly higher mean score than any of the Pakistani children in Pakistan. Considering the concern with CHD in urban areas of Pakistan this indicates a need for health education. At present agencies responsible for public health do not seem to be considering CHD related health education as a major concern. The National Health Education Survey did not attempt to assess knowledge or attitudes about CHD or other chronic diseases. As the rate of urbanisation is increasing in Pakistan this trend of ignoring chronic diseases needs modification.

Children's concept of their body weight seems to be more realistic than their views about their activity. Those who preferred to lose weight actually were heavier, but those who thought themselves to be active did not have a higher physical activity level and were not spending more time in physically demanding activities. This trend was the same in all the six groups, probably children need more guidance or clarification about estimating their Physical Activity Level and increasing it. The results indicate that there is enough concern among children about their body size to have significant impact on their energy intake but this interest in body weight is not having any real influence on activity habits. The reason for this may be that as in general opportunities for children's recreational physical activities are found to be limited in urban areas (Hollnsteiner & Tacon 1982, Schell 1995) children have more control over their diets than their activities. Poor estimation of personal Physical Activity Level coupled with less opportunities for vigorous play activities may have a negative impact on children's health.

Smoking was seen to be an important risk factor in rural Pakistani, British Pakistani and British Caucasian groups.

It appears that in relation to diet and smoking children are influenced by their parents and targeting families rather than individuals of any particular age may influence children's future CHD health related habits.

7. RELATIONSHIP BETWEEN RISK FACTORS

7.1 Clustering Of Risk Factors

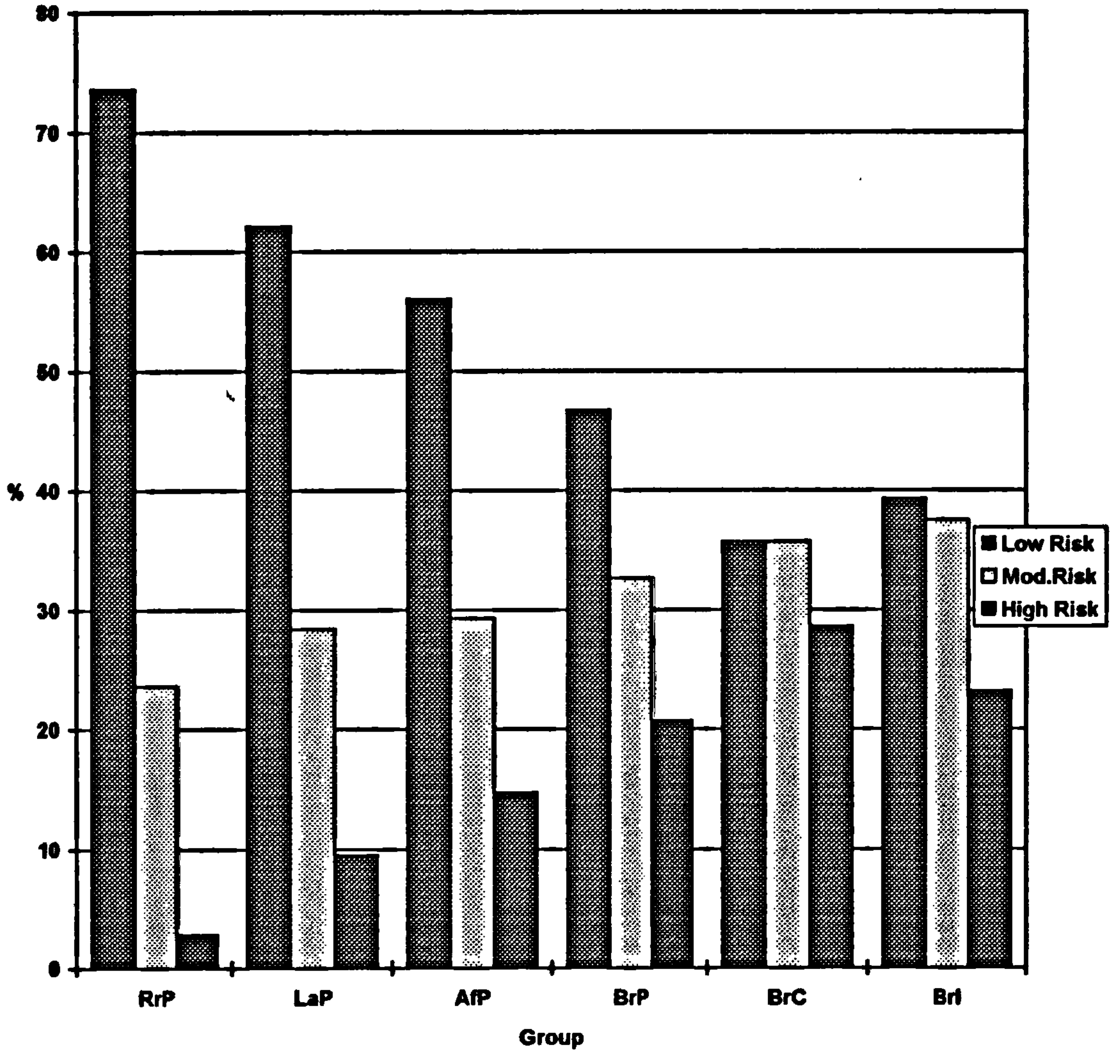
Cluster analysis (K-means cluster) was performed on four outcome risk factors namely fasting blood glucose, total blood cholesterol, body mass index and waist-hip ratio. Three clusters were created. There was significant difference in the central means of three clusters in relation to all the four variables. The first cluster had the least values (indicating lowest risk) and the third the highest values (indicating highest risk) for all the four variables entered.

Chi Square test was done between six social/ethnic groups of children and cluster membership to look at the possible risk status of children. The overall difference between groups was highly significant. The majority of rural Pakistani children (73%) fell into the lowest risk category. Table 7-1 shows the percentage of children from each group falling into each risk cluster as the current risk status of each according to these cluster is as it would be expected to be according to dietary and activity habits of children from each group, these results indicate that diet and lifestyle may be contributing to coronary heart disease risk in these groups. As no direct relationship was observed in this study within each group it is not possible to conclude which of the factors, if any, are definitely related to coronary heart disease risk.

Table 7-1 Differences in Central Means Of The Three Coronary Heart Disease Risk Clusters

Clusters	Central Mean of CHD Risk Factors			
	FBG	TBC	BMI	WHR
1 (low risk)	3.9	4.0	15.0	0.78
2 (moderate risk)	4.1	4.3	18.6	0.79
3 (high risk)	4.2	4.4	23.7	0.83
p value	0.001	0.000	0.000	0.003

Table 7-2: Figure 7-1: Percentage Distribution Of Children Within Each Group in Three CHD Risk Clusters



7.2 Relationship Between Risk Factors

The relationship between physical (WHR and BMI), biochemical (FBG and TBC), dietary (food and nutrient intake), activity, family history, knowledge risk factors was examined using analysis of covariance. Four separate models were built for studying the effect of other factors on FBG, TBC, BMI (log transformed) and WHR.

7.2.1 Fasting blood glucose

Group, sex, body mass index and knowledge score had an effect on fasting blood glucose. Age did not have any significant effect on fasting blood glucose.

Girls had lower fasting blood glucose than boys and this trend was similar in all the groups.

Body mass index had a positive relationship with fasting blood glucose but this relationship was significantly different between groups. The association was significantly less pronounced in less affluent urban Pakistani and more pronounced in rural Pakistani groups in relation to overall effect.

The knowledge score was negatively associated with fasting blood glucose but this association was significantly positive only in boys.

According to combined adjusted means among all the six groups, less affluent urban Pakistani children had the highest fasting blood glucose and the rural Pakistani children had the lowest fasting blood glucose levels. Between the three UK groups, British Caucasians had the lowest and British Pakistani had the highest fasting blood glucose level.

7.2.2 Total blood cholesterol

There was a significant overall effect of BMI on TBC which varied significantly between groups. The effect of BMI on TBC was significantly different (most pronounced) in British Caucasian and was only marginally non significant (weakest) in affluent Pakistani children as compared to the other four groups.

The relationship between fasting blood glucose and TBC was positive overall but varied to such a degree in different groups that the overall effect was not significant. The slope of association between fasting blood glucose (FBG) and total blood cholesterol (TBC) was least pronounced for British Caucasian and most pronounced for British Indian children. None of the other factors (dietary, activity, family disease history and knowledge) had any association with total blood cholesterol level.

According to adjusted means (for age, sex, FBG and BMI) rural Pakistani children had the lowest total blood cholesterol. British Caucasian children had the highest total blood cholesterol followed by British Indian and British Pakistani (who were similar to each other) Less affluent and affluent Pakistani children had mean total blood cholesterol higher than rural but lower than any of the British children.

Figure 7-2: Observed and adjusted Fasting Blood Glucose (FBG) of children According To Group

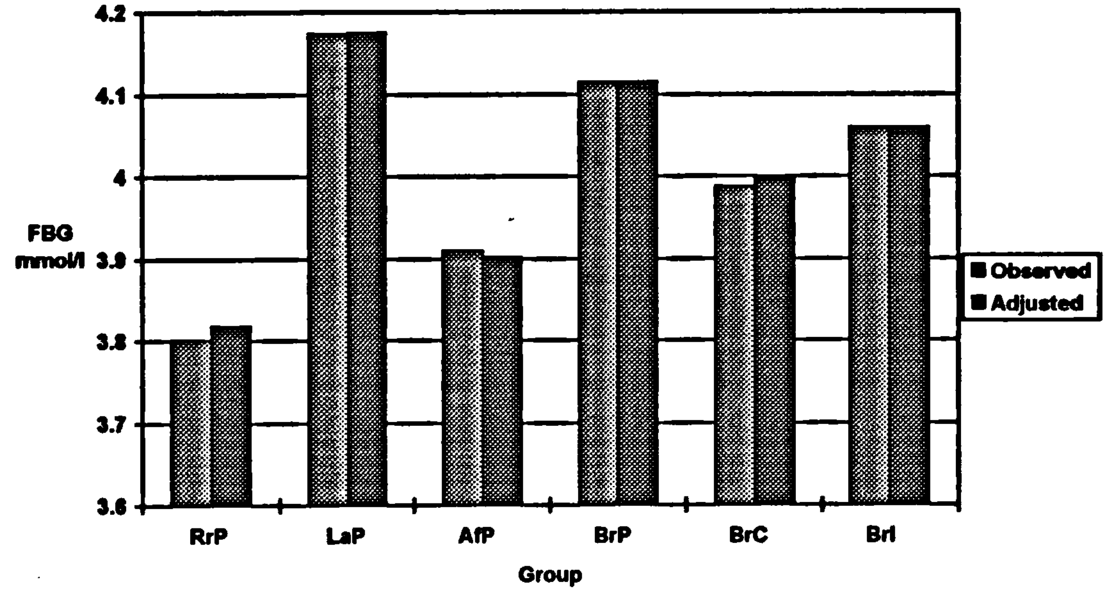
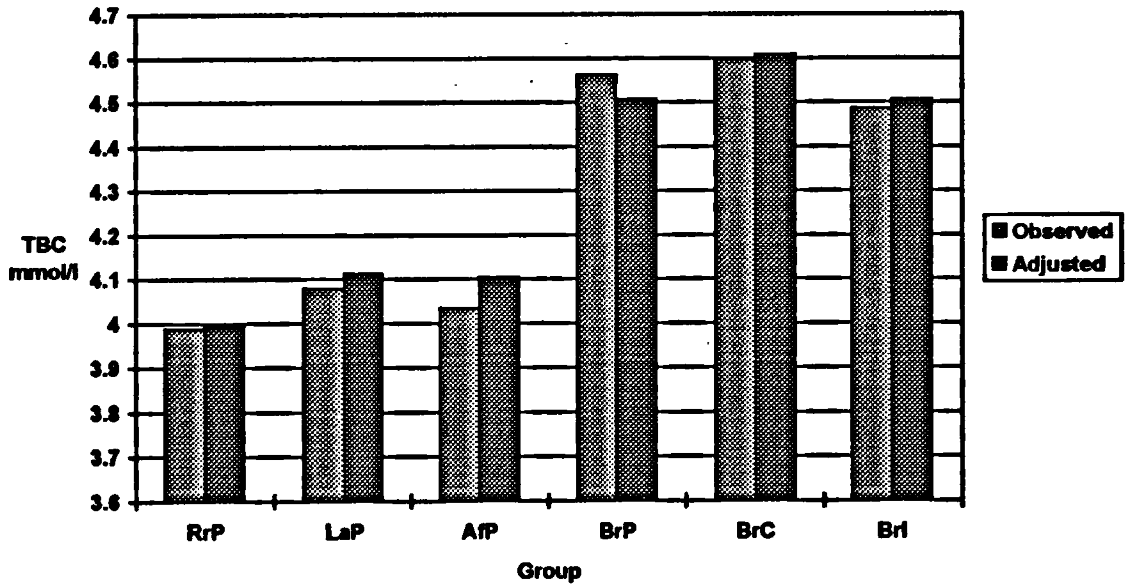


Figure 7-3: Observed and adjusted Total Blood Cholesterol (TBC) of children According To Group



7.2.3 Body mass index

Fasting blood glucose, waist-hip ratio, total blood cholesterol, group, sex and interaction between sex and TBC had an effect on body mass index. Fasting blood glucose, total blood cholesterol and waist-hip ratio had a strong positive relationship with body mass index and this relationship was not significantly different in different groups. The relationship between cholesterol and BMI was however significantly different between girls and boys.

The group had effect on body mass index. Rural Pakistani and less affluent Pakistani children had significantly lower mean BMI than the overall mean, while British Caucasian and British Indian children had significantly higher mean body mass index than average.

According to adjusted means, girls had higher body mass index than boys. The effect of TBC on body mass index was less marked in girls.

Table 7-2: Combined Observed And Adjusted Means of BMI According To Group, Sex And Age

	Observed		Adjusted	
	log transformed	*original*	log transformed	*original*
Group				
RrP	1.17036	*14.80*	1.18764	*15.40*
LaP	1.20284	*15.95*	1.21125	*16.26*
AfP	1.21548	*16.42*	1.23140	*17.04*
BrP	1.24811	*17.71*	1.24369	*17.53*
BrC	1.26262	*18.31*	1.26940	*18.60*
BrI	1.26827	*18.55*	1.25376	*17.94*
Sex				
Girls	1.22702	*16.87*	1.24770	*17.69*
Boys	1.22967	*16.97*	1.21722	*16.49*
Age				
10	1.21564	*16.43*	1.23614	*17.22*
11	1.23082	*17.01*	1.23203	*17.06*
12	1.23739	*17.27*	1.23080	*17.01*

Figure 7-4: Observed and adjusted mean BMI (wt/ht^2) According To Group

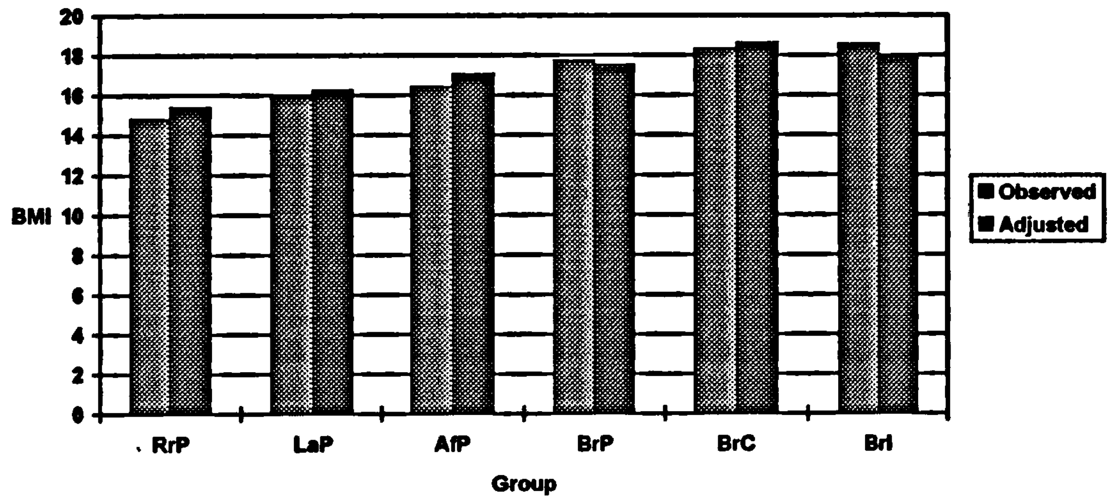
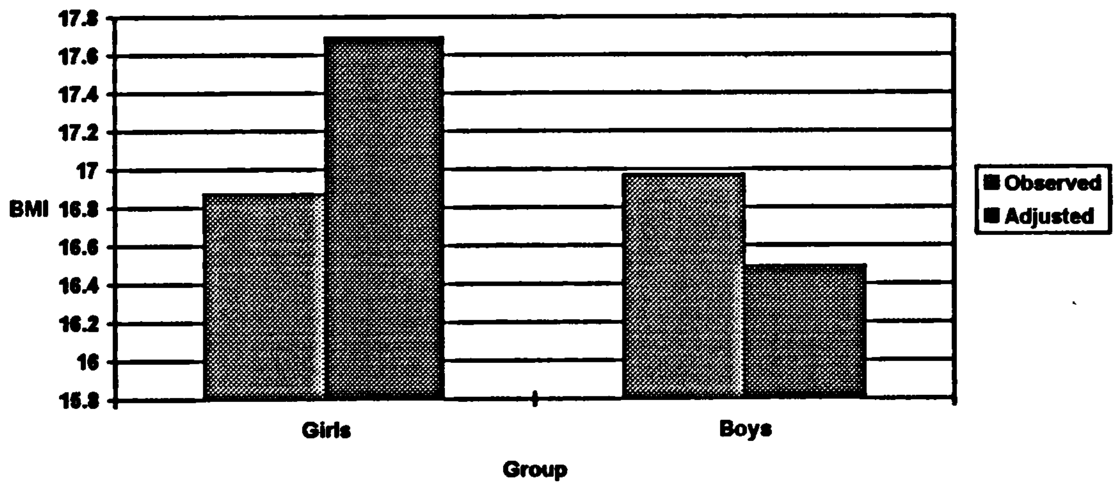


Figure 7-5: Observed and adjusted mean BMI (wt/ht^2) According To sex



7.2.4 Waist-hip ratio

BMI and sex had a significant effect on waist-hip ratio. BMI had a significant positive effect on WHR. Girls had a significantly lower WHR than boys. The effect of BMI on waist-hip ratio was different in different groups. The slope was slightly, but significantly, less steep for affluent Pakistani children and slightly, but significantly more steep for British Pakistani children in relation to overall effect. This indicates that for British Pakistani children the rate of increase in WHR with increasing BMI is likely to be the fastest for all the groups studied. Higher rates of central adiposity have been reported also among South Asians adults living in UK. However due to lack of data regarding prevalence of cetral adiposity among sedente South Asians it cannot be concluded that this tendency is mainly genetical.

Figure 7-6: Combined observed and adjusted means of WHR According To Group

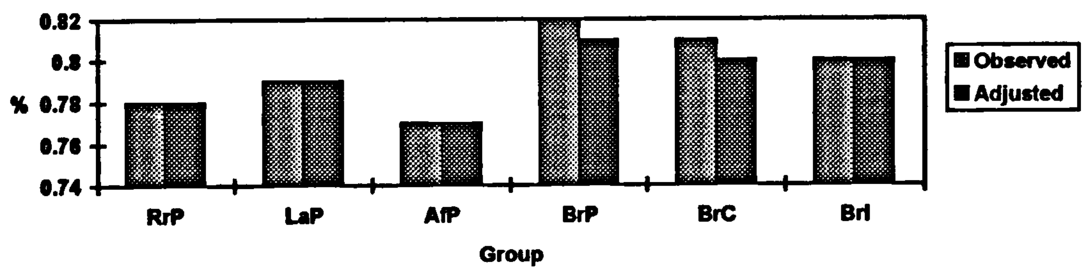
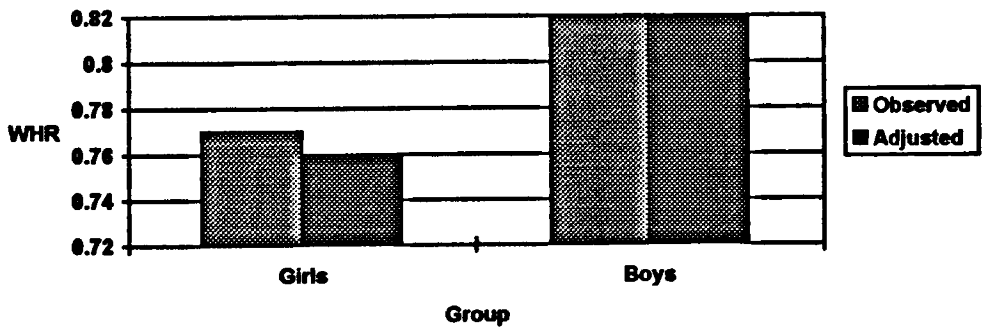


Figure 7-7: Combined observed and adjusted means of WHR According To sex



7.3 Relationships Among CHD Risk Factors In Different Groups

Clustering of risk factors and inter group differences in cluster membership, point towards the possible role of environmental factors in CHD risk status of children. Analysis of covariance showed relationships between biochemical and physical risks but failed to relate dietary and activity habits to physical or biochemical risks. Keeping in mind the variability in diet and lifestyle of the six groups, the limitations of the nutrient database and the size of the sample this was not unexpected. So another approach was used to look at the relationship between diet and other factors within each group.

For each risk factor variable children were assigned an arbitrary rank of 1 (low risk) or 2 (high risk) according to their within group membership in lower or upper 50th percentile. For instance rural children having FBG values below the average value for rural children were given a rank of 1 (low FBG risk) and those having FBG above the mean for rural children were given a rank of 2 for FBG.

Separate Chi square tests were conducted to look at the differences in dietary and activity habits of children belonging to low or high risk category of characteristics relevant for CHD. As the purpose of this analysis was to look at the differences in relationship between CHD risk factors in the six different group being studied the cut off point for all the characteristics (excluding cholesterol) was 50th percentile within each group. The same cut off points could not be used for all the six groups because of the wide variation in central tendencies between groups and by doing so within group differences were obscured. But for cholesterol the same cut off point was used because even with this cut off point there were enough cases in both low and high risk groups in all the six socio-ethnic groups to make comparisons. There was also an advantage in using this cut-off point because it is the level (4.4 mmol/l) above which dietary guidance is suggested. Further more this cut off point has also been used in previous studies carried out in Pakistani children (Badruddin et al 1991, 1994).

Information regarding food consumption refers to frequency of food consumption as noted in food records (at least once in three days).

This analysis revealed a pattern of relationship between risk factors which indicates the possibility of environmental impact on CHD risk status. Only statistically significant differences are discussed here. Tables 7-4 to 7-8 show percentage distribution of children in relation to various CHD risk relevant characteristics.

7.3.1 British Pakistani children

- ***Total blood cholesterol***

No significant association was seen between consumption of any particular food and blood cholesterol level of children.

- ***Fasting blood glucose***

Children with a higher fasting blood glucose level consumed fizzy drinks more often than those with a lower glucose level.

- ***Body mass index***

The high BMI group ate raw or boiled vegetables, potatoes and crisps and kabab less often and eggs less often than low BMI group.

- ***Waist-hip ratio***

Children with a higher Waist-hip Ratio ate raw or boiled vegetable less frequently than those who had a lower Waist-hip Ratio. Children with a higher WHR were more frequently (60%) with a higher Physical Activity Level than those with a lower WHR (31%).

7.3.2 British Caucasian children

- ***Total blood cholesterol***

No significant association was seen between consumption of any particular food and blood cholesterol level of children.

- ***Fasting blood glucose***

Children with a higher fasting blood glucose level consumed raw or boiled vegetables more often than those having lower glucose level.

- ***Body mass index***

The high BMI group ate white bread and rice more often and fruit yoghurt and biscuits less often than low BMI risk group. Children with a higher proportion of energy coming from carbohydrates more often had a lower BMI.

- ***Waist-hip ratio***

Children with a higher waist-hip ratio ate cakes less frequently than those having lower WHR.

7.3.3 British Indian children

- ***Total blood cholesterol***

No significant association was seen in consumption of any particular food and blood cholesterol level of children. However children with a higher cholesterol level more often (60%) had a lower level of carbohydrate intake (as percentage of energy intake from carbohydrates) as compared to the low cholesterol group (30%)

- ***Fasting blood glucose***

Children with a higher fasting blood glucose level consumed white bread and cakes more often than those with a lower glucose level.

- ***Body mass index***

The High BMI group ate fried fish, boiled egg and boiled rice more often and raw or boiled vegetables and sweets less often than the low BMI group. A higher proportion of children from high the PAL category (67%) had higher BMI as compared to those having a lower PAL (37%).

- ***Waist-hip ratio***

Children with a higher waist-hip ratio ate crisps less frequently and meat curry more frequently than those having a lower waist-hip ratio. Children with a higher WHR were more often having a higher physical activity level.

7.3.4 Affluent urban Pakistani children

- ***Total blood cholesterol***

Higher cholesterol risk was associated with more frequent consumption of crisps, sweets and chocolates.

- ***Fasting blood glucose***

But out of those children who had higher glucose level a lower proportion consumed desserts and ice creams as compared to those having lower glucose levels

- ***Body mass index***

Children with a higher body mass index more frequently obtained a lower percentage of energy from carbohydrates and higher percentage of energy from protein in their diets as compared to the low BMI group..

- ***Waist-hip ratio***

Children with a higher waist-hip ratio ate vegetable pasties and chutney less often and meat 'kababs' more often than those with a lower waist-hip ratio. Children with a higher WHR more frequently had a higher physical activity level than those with a lower WHR

7.3.5 Less affluent urban Pakistani children.

- ***Total blood cholesterol***

Higher cholesterol was associated with more frequent consumption of vegetable pasties (patties) and meat and vegetable curries.

- ***Fasting blood glucose***

Children obtaining a higher percentage of energy from sugar in their diets more often had higher FBG than those having a lower sugar intake.

More frequent consumption of fried snacks was associated with higher FBG. Children having higher energy intakes more often had lower FBG.

- ***Body mass index***

Children having a higher BMI had lower energy intakes (per kg body weight).

- ***Waist-hip ratio***

Children with a higher waist-hip ratio consumed kabab and butter or margarine more often and vegetable 'pulao' less often than those having lower waist-hip ratio. Children who obtained a higher percentage of energy from carbohydrates in their diets more frequently had lower WHR than those who had lower carbohydrate intakes.

7.3.6 Rural Pakistani children

- ***Total blood cholesterol***

A higher percentage of children from the high cholesterol group ate fried snacks, biscuits, nuts and Asian desserts. The high risk group ate lentils less frequently than low risk group.

- ***Fasting blood glucose***

Children belonging to the lower fasting blood glucose level category had more frequent consumption of fried snacks and desserts, but ate meat curry less often than the low risk group.

- ***Body mass index***

The high BMI risk group ate vegetable 'pulao' more often and eggs less often than low BMI risk group. Children having a higher BMI reported lower energy intakes (per kg body weight).

Children having a higher BMI had a higher intake of carbohydrates (percentage of energy).

- ***Waist-hip Ratio***

Children with higher waist-hip ratio were more likely to eat sweets and 'kababs' than those having lower WHR. Children having higher energy consumption per kg body weight more frequently had a higher waist-hip ratio.

Table 7-3: TBC, FBG, BMI, WHR according to group and PHYSICAL ACTIVITY LEVEL (average for week)

	RrP		LaP		AfP		BrP		BrC		BrI	
	low	high	low	high	low	high	low	high	low	high	low	high
	%	%	%	%	%	%	%	%	%	%	%	%
Cholesterol												
below 4.4 mmol/l	92	81	82	74	82	74	57	63	50	50	52	**48**
above 4.4mmol/l	**8**	19	18	26	18	26	43	37	50	50	48	52
Glucose												
below 50th percentile	57	65	53	49	41	48	58	40	46	43	58	46
above 50th percentile	43	35	48	51	59	52	42	60	54	57	42	54
BMI												
below 50th percentile	46	61	50	49	**29**	**57**	44	49	50	46	**63**	**33**
above 50th percentile	54	39	50	51	**71**	**43**	56	51	50	54	**37**	**67**
WHR												
below 50th percentile	67	67	61	55	**77**	**33**	**69**	**40**	43	54	63	40
above 50th percentile	33	33	39	45	**23**	**67**	**31**	**60**	57	46	37	60

* figures in bold indicate p<0.05

Table 7-4: Nutrient Intake, TBC, FBG And Body Mass Index According To Group And WAIST-HIP RATIO

	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	low	high	low	high	low	high	low	high	low	high	low	high
	%	%	%	%	%	%	%	%	%	%	%	%
P: S ratio												
below 50th percentile	43	64	45	54	44	57	55	42	42	55	57	48
above 50th percentile	57	36	55	46	56	43	45	58	58	45	43	52
% energy from CHO												
below 50th percentile	43	64	**39**	**67**	48	48	43	61	42	55	48	52
above 50th percentile	57	36	**61**	**33**	52	52	57	39	58	45	52	48
% energy from Protein												
below 50th percentile	52	45	42	58	56	48	55	42	50	55	57	41
above 50th percentile	48	55	58	42	44	52	45	58	50	45	43	59
% energy from Fats												
below 50th percentile	62	36	61	38	56	48	55	45	58	36	43	55
above 50th percentile	38	64	39	63	44	52	45	55	42	64	57	45
NSP (gm/100Kcal)												
below 50th percentile	48	55	39	63	48	52	45	52	58	45	43	48
above 50th percentile	52	45	61	38	52	48	55	48	42	55	57	52
Sugar (gm/100Kcal)												
below 50th percentile	43	64	50	50	44	52	40	61	33	64	57	45
above 50th percentile	57	36	50	50	56	48	60	39	67	36	43	55
Kcal/ kg body weight												
below 50th percentile	**67**	**27**	61	33	59	39	48	52	50	45	39	59
above 50th percentile	**33**	**73**	39	67	41	61	52	48	50	55	61	41
TBC												
below 4.4 mmol/l	89	86	80	74	69	93	57	60	57	47	61	43
above 4.4mmol/l	11	14	20	26	31	8	43	40	43	53	39	57
FBG												
below 50th percentile	57	48	47	55	**50**	**38**	49	44	**67**	**25**	55	48
above 50th percentile	43	52	53	45	**50**	**62**	51	56	**33**	**75**	45	52
BMI												
below 50th percentile	**42**	**64**	48	50	47	51	55	44	50	47	**70**	**30**
above 50th percentile	**58**	**36**	52	50	53	49	45	56	50	53	**30**	**70**

* figures in bold indicate $p<0.05$

Table 7-5: Nutrient intake, TBC and FBG According To Group and BODY MASS INDEX

	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	low	high	low	high	low	high	low	high	low	high	low	high
	%	%	%	%	%	%	%	%	%	%	%	%
P: S ratio												
below 50th percentile	44	56	57	41	54	46	63	39	42	55	63	43
above 50th percentile	56	44	43	59	46	54	38	61	58	45	38	57
% energy from CHO												
below 50th percentile	69	33	53	47	33	62	53	49	25	73	46	54
above 50th percentile	31	67	47	53	67	38	47	51	75	27	54	46
% energy from Protein												
below 50th percentile	44	56	50	47	67	38	56	44	67	36	50	46
above 50th percentile	56	44	50	53	33	62	44	56	33	64	50	54
% energy from Fats												
below 50th percentile	38	61	50	53	54	50	50	51	67	27	46	54
above 50th percentile	63	39	50	47	46	50	50	49	33	73	54	46
NSP (gm/100Kcal)												
below 50th percentile	56	44	47	50	54	46	56	41	33	73	50	43
above 50th percentile	44	56	53	50	46	54	44	59	67	27	50	57
Sugar (gm/100Kcal)												
below 50th percentile	56	44	57	44	38	58	41	56	33	64	33	64
above 50th percentile	44	56	43	56	63	42	59	44	67	36	67	36
Kcal/ kg body weight												
below 50th percentile	13	83	30	69	25	73	22	71	17	82	33	64
above 50th percentile	88	17	70	31	75	27	78	29	83	18	67	36
Cholesterol												
below 4.4 mmol/l	92	83	89	66	78	84	61	57	58	47	63	41
above 4.4mmol/l	8	17	11	34	23	16	39	43	42	53	37	59
Glucose												
below 50th percentile	64	44	54	49	49	41	51	42	47	44	66	39
above 50th percentile	36	56	46	51	51	59	49	58	53	56	34	61

* figures in bold indicate $p<0.05$

Table 7-6 Nutrient Intake And TBC According To Group And FASTING BLOOD GLUCOSE

	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	low	high	low	high	low	high	low	high	low	high	low	high
	%	%	%	%	%	%	%	%	%	%	%	%
P: S ratio												
below 50th percentile	50	56	52	52	50	50	50	47	45	42	61	50
above 50th percentile	50	44	48	48	50	50	50	53	55	58	39	50
% energy from CHO												
below 50th percentile	50	44	52	48	55	55	50	50	55	50	43	50
above 50th percentile	50	56	48	52	45	45	50	50	45	50	57	50
% energy from Protein												
below 50th percentile	44	56	45	56	65	50	54	50	45	58	48	46
above 50th percentile	56	44	55	44	35	50	46	50	55	42	52	54
% energy from Fats												
below 50th percentile	50	56	48	52	40	45	54	50	55	33	52	50
above 50th percentile	50	44	52	48	60	55	46	50	45	67	48	50
NSP (gm/100Kcal)												
below 50th percentile	56	33	45	52	55	50	46	50	36	58	48	50
above 50th percentile	44	67	55	48	45	50	54	50	64	42	52	50
Sugar (gm/100Kcal)												
below 50th percentile	56	22	68	32	50	45	46	56	36	67	43	50
above 50th percentile	44	78	32	68	50	55	54	44	64	33	57	50
Kcal/ kg body weight												
below 50th percentile	50	67	32	76	40	50	36	57	30	58	43	61
above 50th percentile	50	33	68	24	60	50	64	43	70	42	57	39
Cholesterol												
below 4.4 mmol/l	91	77	71	85	82	79	59	58	50	53	62	41
above 4.4mmol/l	9	23	29	15	18	21	41	42	50	47	38	59

* figures in bold indicate $p<0.05$

Table 7-7: Nutrient Intake According To Group And TOTAL BLOOD CHOLESTEROL

	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	low	high	low	high	low	high	low	high	low	high	low	high
	%	%	%	%	%	%	%	%	%	%	%	%
P: S ratio												
below 50th percentile	44	67	54	40	52	44	43	61	30	60	52	55
above 50th percentile	56	33	46	60	48	56	57	39	70	40	48	45
% energy from CHO												
below 50th percentile	52	33	52	40	52	67	51	52	60	60	30	60
above 50th percentile	48	67	48	60	48	33	49	48	40	40	70	40
% energy from Protein												
below 50th percentile	44	67	54	30	61	44	49	52	40	60	57	45
above 50th percentile	56	33	46	70	39	56	51	48	60	40	43	55
% energy from Fats												
below 50th percentile	44	100	48	60	45	33	49	52	40	30	57	45
above 50th percentile	56	0	52	40	55	67	51	48	60	70	43	55
NSP (gm/100Kcal)												
below 50th percentile	52	33	48	50	48	67	59	39	40	50	35	60
above 50th percentile	48	67	52	50	52	33	41	61	60	50	65	40
Sugar (gm/100Kcal)												
below 50th percentile	52	67	50	60	48	44	41	61	60	50	43	45
above 50th percentile	48	33	50	40	52	56	59	39	40	50	57	55
Kcal/ kg body weight												
below 50th percentile	48	100	52	50	42	56	42	48	44	50	59	45
above 50th percentile	52	0	48	50	58	44	58	52	56	50	41	55

* figures in bold indicate $p<0.05$

7.4 Discussion

The results presented in this chapter show that overweight is an important factor associated with FBG and TBC even at this early age. Association of body weight with cardiovascular risk in children has also been documented by others (Rona et al 1996, Resnicow & Morabia 1990, Williams et al 1992).

Like other researchers in this field (Durnan-Tauleria et al 1995, Rolland-Cachera and Bellisle 1986, Gliksman 1993, Rona 1996) this study also did not indicate any significant and consistent (in all the groups) relationship between food and nutrient intake, activity habits or physical activity level of children and their BMI or WHR. No attempts were made to assess parents' body weight in this study but others (Durnan-Tauleria et al 1995) have reported a strong relationship of childhood obesity with parents' BMI.

A relationship between eating patterns and blood lipids has been reported by Nicklas et al (1989) but this study did not reveal any significant relationship between diet and blood lipids which was consistent in all the six groups. However in the three Pakistani groups, different fatty foods were associated with higher cholesterol levels.

Although this study did not reveal any consistent intra group relationships inter-group associations between diet, exercise and CHD risk, were indicated by the differences in proportion of children falling into various CHD risk clusters from each group. For instance, looking at the dietary and activity habits of rural Pakistani children they could be anticipated to be at a lower CHD risk and in fact the lowest proportion of children from this group were in high CHD risk category. It could be anticipated that further studies with large samples may reveal consistant intra group relationships between diet, exercise and CHD risk.

8. DISCUSSION, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

8.1 Discussion

" Cumulative differential exposure to health damaging or health promoting physical and social environments is the main explanation for observed variations in health..." (Variations in health DHSS 1995)

8.1.1 Urbanisation, diet and health in Pakistan

Scientists have long recognised the importance of demographic and epidemiological transitions in higher income countries. Only recently has it become understood that similar sets of broadly based changes are occurring in lower income countries. Examples from Thailand, China and Brazil provide evidence of the changes and trends in dietary intake, physical activity and body composition pattern (Popkin 1994). Distinct rural-urban differences in dietary and activity habits and physical and biochemical characteristics of Pakistani children found in this study and information available through national surveys indicate that similar changes are occurring in Pakistan.

Changes taking place in low income countries during the past decade appear to be similar to those seen in high income countries. But as the changes are taking place at an accelerated rate in low income countries, the consequences might not be exactly the same. In developed countries the shift in diet and lifestyle was a rather gradual process (Slattery 1988) as compared to the current rapid rate of urbanisation in low income countries. For example in China the transition from mass poverty to overall prosperity of the nation took place in just forty years. Research in Southeast Asian countries (China, Indonesia, Malaysia and Thailand) indicates that in general problems of under- and overnutrition are found to coexist in these countries, reflecting the trend in which an increasing proportion of people consume the types of diets associated with a number of chronic diseases. Changes in food consumption indicate that these countries are moving along somewhat different paths towards a diet associated with a degenerative disease pattern. The actual foods differ in each country, leading one to expect the resulting long term health implications will also vary (Popkin, 1994). Diet and activity related paradigms that urban areas throughout the developing world have in common include increased consumption of processed foods, fast foods, novel foods and nutrient supplements; sedentary life pursuits; street vendors and street foods (Solomons 1995).

8.1.2 Variations in diet and activity associated with urbanisation and migration and consequences for health.

In view of the experience of other low income countries similar concerns regarding effects of economic prosperity and urbanisation are justified for certain sections of the population. Urbanisation is increasing in Pakistan. The annual population growth rate is 3% and that of urban population is 4% (GoP 1995). Although the rate of economic growth is not high the impact of rural to urban migration or of increasing prosperity within rural or urban areas are likely to be similar to that of accelerated urbanisation. This phenomenon applies rather more markedly to those who move from rural areas of Pakistan to urban areas of developed countries. This idea has been well expressed by Reclus (1905), that " *geography is nothing but history and into space and similarly history is geography on a time scale*". If we view the differences between different groups of children in this study and differences noticed by others in rural, urban and emigrant to UK South Asians in the light of this phenomenon it seems that they are at different stages of a similar process. Their routes are different and so is the rate of their progress and their assets to cope with accompanying changes and challenges. The interaction between these variables is probably making a difference in their health status.

- ***British Pakistani children in UK***

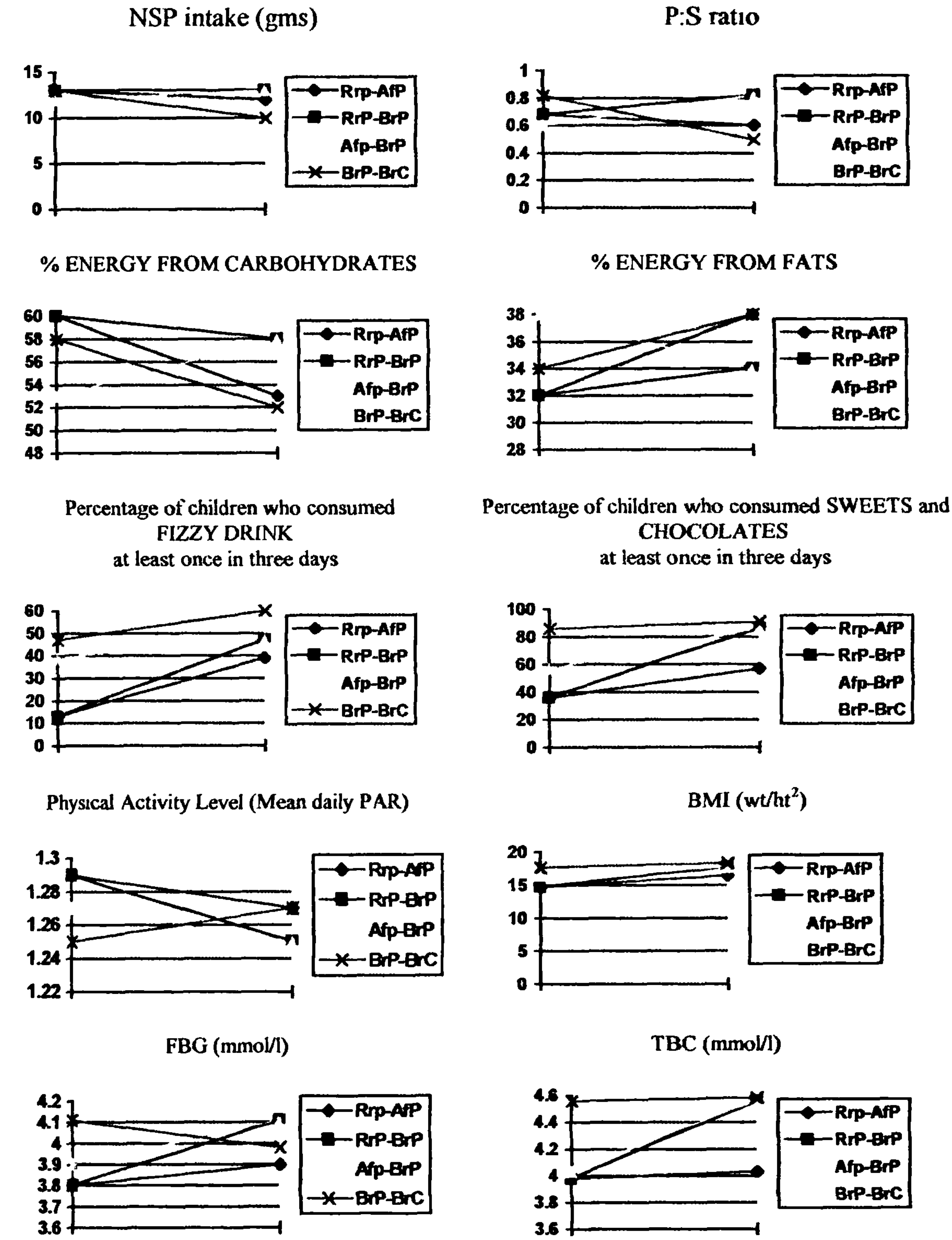
For the first generation of South Asians immigrants to UK the sudden transition from a rural environment of a low income country to urban areas of a high income country was similar to accelerated urbanisation. For their offspring assimilation of a western lifestyle is a rather slow process. They are not facing the sudden battery of changes their parents did. But they are not in the same situation in terms of diet and lifestyle as their British Caucasian agemates. They do not differ significantly from them in terms of energy intake, height or weight but they do in terms of consumption of certain foods and physical and biochemical variables. They may not need to struggle as much as their parents did settling in a new country, but it is not likely that they feel as much at home as their British

Caucasian age mates do. So the cumulative effect of various, dietary and other lifestyle related factors may be different from what it was for their parents and also from what would be for their British Caucasian agemates.

The similarity of the trends observed in differences between the diets and other CHD risk factors of rural and urban Pakistani children and those of rural Pakistani children in comparison with British Pakistani children (Figure 8-1), suggests that environmental changes would have been responsible for an increase in CHD rate in Pakistani immigrants to the UK. If rapid adaptation to an urban environment was a major factor responsible for high CHD mortality among their older generation we may hope that these children would fare better than their parent in terms of NIDDM and CHD mortality. But at the same time a striking similarity has been shown in the pattern of differences between British Caucasian and South Asian children and differences in the respective adult population in terms of TBC, FBG, BMI and waist-hip ratio which directs our attention towards the likelihood of a genetic predisposition. So what we may conclude from our findings is that while higher CHD in South Asians in UK and in urban areas of Pakistan and other South Asian countries appears to be a reiteration of a global phenomenon of an increase in non communicable diseases in industrialised (or westernised) populations associated with changes in diet and lifestyle, the extraordinarily high rates of NIDDM and CHD in immigrant to UK South Asians are probably triggered by some genetic propensities.

Apart from any genetic considerations, results concerning other factors suggest that South Asian children in UK may be at increased risk of CHD. Although at this point it is not possible to predict the influence of the possible cardioprotective benefits which the work of Barker (1994, 1995), Osmond et al (1993) and Frankel et al (1996a 1996b) suggests might accrue from the improved nutrition in pregnancy and early life of Pakistani children born in the UK. Considering the overall situation of physical and biochemical risk, activity level and knowledge it seems that unless preventive measures are taken, a significant fall in CHD mortality in the next generation of South Asians to match the national average may be difficult.

Figure 8-1: Summary Of Differences In Mean BMI, TBC, FBG And Food And Nutrient Intake Between RrP & AfP; RrP & BrP; AfP & BrP And BrP & BrC Children



- ***British Pakistani children and Pakistani children in Pakistan.***

British Pakistani children do not match any group of children in Pakistan. In terms of collective physical and biochemical risk and consumption of certain foods like biscuits, cakes, fizzy drinks etc. they resemble affluent Pakistani children but considering the socio-economic factors, smoking and consumption of many foods they are more close to less affluent Pakistani children. The parents of British Pakistani children no doubt moved from a rural area of a developing country to urban areas of a developed country, but the adaptation of western lifestyle by the parents and their children has been checked by religious and economic factors. The consumption of foods containing meat or fat by the British Pakistani children might have been much higher if they did not have concerns about them being halal. Consumption of animal foods was higher among affluent Pakistani children as compared to British Pakistani children. Consumption of fresh fruits and vegetables was found to decrease with decreasing income in UK (DHSS 1989) and in Pakistan (GoP 1993). In this study, possibly because of being at a lower economic level, British Pakistani children had lower fresh fruit and vegetable consumption than national averages. On the other hand affluent Pakistani children in Pakistan were likely to consume more of these foods than the average for Pakistan. So as British Pakistani children in UK are members of a low income urban population and even though they are living in a higher income country in many dietary respects, they are like low income urban Pakistanis rather than affluent urban Pakistani children.

- ***Intra urban differences in Pakistan***

In high income countries the pattern of chronic diseases like CHD has changed from one of higher prevalence among the most affluent to higher prevalence among lower income groups. In the UK CHD is higher among lower social classes (DoH, 1995). Low income countries may follow the same pattern. The problem of dietary excess in the poor are cause of concern for many nutritionists (Popkin 1994) In this study a higher percentage of affluent Pakistani parents responded that any of their family members had CHD or diabetes. But looking at the current similarity of less affluent and affluent Pakistani children in terms of CHD risk factors and diet and considering the interaction of these factors with economic and psycho-social factors it is likely that within a few decades the scenario may change. As noticed in developed countries high income and more educated groups have shifted towards adopting healthier lifestyles by modifying their diet (Stephen 1984). For instance in America among lower income groups there is no evidence of a positive dietary shift. The combination of minimal dietary change and reduced physical activity among lower income groups may be part of the reason why lower income groupshave a higher proportion of obesity than higher income groups (Kuckmarski 1992, Popkin et al 1994, Sobal 1989). A similar trend was noticed among children in Pakistan. Urban affluent children had a lower energy and fat intake, lower fasting blood glucose and cholesterol levels, lower waist-hip ratio, less frequently had smokers in their families, had better cardiovascular knowledge than less affluent urban children. Though these difference were not large or statistically significant they do indicate a trend. Badruddin et al (1994) also noticed that lower middle class children were not very different from upper class children in Karachi in terms of TBC or obesity.

- ***Rural Pakistani children***

Rural Pakistani children were markedly different from both the urban Pakistani groups and also from the British Pakistani group in most dietary and activity habits. But in terms of smoking they were more like British Pakistani children, nearly 50% of them having a smoker in the family. Excluding smoking they seem to have the lowest risk for CHD. But in view of the theory of programming for chronic diseases their risks may increase rapidly if an urban lifestyle is adopted. They were on average the lightest and the shortest and had the lowest energy intakes. They were most likely to be malnourished and many of them may have been low birth weight babies. Higher rates of smoking in rural areas of Pakistan have been reported in national health surveys also (GoP, 1992).

- ***British Indian children***

British Indian children who appeared to be similar to British Pakistani children in terms of physical and biochemical variables, diet and activity in fact had certain dietary and other dissimilarities which may exert some influence in the long run.

Most of them had a higher consumption of cheese and certain meat products when compared to British Pakistani children. In general they were more acculturated in their food habits and relatively speaking considered religion to be a less important factor affecting their food choice. They also had higher exposure scores so in future they are more likely to adopt western food habits as compared to British Pakistani children. But they also had slightly better socio-economic status and their mothers were more educated and had been living longer in the UK than mothers of British Pakistani children. So along with proceeding towards a more westernised and probably more atherogenic diet, they may benefit from the economic and educational status of their parents.

As in this study the Indian children were not compared with their agemates in India so no conclusions could be drawn regarding the differences in the diets and activity habits and CHD risk of British Indian and Indian children in India. But results from other studies which compared immigrants to the UK and sedente Indian adults, indicate similar differences to those noticed in this study between British Pakistani children and Pakistani children in Pakistan. In a comparative study of sedente and emigrant to UK siblings, migrants were found to have a higher body mass index, waist-hip ratio and blood cholesterol (Bhatnagar et al 1995). Another study noticed an interesting trend in the extent and nature of bodily changes which were different in three different castes belonging to low, middle and higher income groups. Subjects representing the three socio-economic classes were studied in the Indian Punjab and in the UK. The low income group in India was significantly lighter and shorter than the two more affluent groups and the most affluent were the heaviest and tallest. Among the migrant group the intra caste difference between sedente and migrant was greatest in the lowest income group and least in highest income group. Since the difference in height between the three castes was the same the low income group had higher body mass index (Singh & Harrison1996). So it may be speculated that the differences between British Indian children and their agemates in India are likely to be similar to those observed between British Pakistani children and Pakistani children in Pakistan.

- ***Differences between British Indian and British Pakistani children in relation to British Caucasian children.***

Although British Indian and British Pakistani children had certain similarities in terms of dietary and exercise habits and physical and biochemical risks, the pattern of these bilateral differences was not always symmetric. The eating patterns found to be common in both British Indian and British Pakistani children included higher consumption of wholemeal Asian bread, vegetable curries and lower consumption of meat as compared to British Caucasian children. But as a whole British Indian children had slightly more westernised diets than British Pakistani children. Both the groups of fathers had similar length of stay in the UK, but British Indian mothers had a longer length of stay, were more educated and more often worked outside home than British Pakistani mothers, greater acculturation of the British Indian children may be associated with their mothers' demographic characteristics.

8.2 Conclusions

1. In general the differences in dietary and activity habits and anthropometric and blood profile of rural and affluent and less affluent urban Pakistani children in Pakistan were of a similar nature to those which are found to accompany urbanisation and economic prosperity in other developing countries. Diet and activity habits of the urban, particularly affluent urban children, seems to be more atherogenic. Higher CHD risk among the affluent and less affluent urban Pakistani children was indicated by higher levels of BMI, TBC and FBG in comparison with rural Pakistani children.

2. Diet and activity habits of the British Pakistani children were often, but not always, comparable to the affluent urban Pakistani children. However in terms of CHD risk British Pakistani children were obviously closer to affluent urban Pakistani children than to the rural Pakistani children.

3. British Pakistani children were closer to British Indian children in their diet and activity habits and CHD risk than to British Caucasian children. However the food and activity pattern and CHD risk status of the two South Asian groups of children was not exactly the same.

4. Significant differences between the four Pakistani groups studied in terms of CHD risk related characteristics indicates that the possibility of purely genetic origin of the disease is extremely low. The higher CHD mortality appears to be related to changes in the lifestyle of the immigrants.

5. Within the four Pakistani groups, the groups having higher mean fat intakes also had relatively higher total blood cholesterol levels. Associations between BMI, TBC and FBG were also noticed. It is likely that interaction between CHD risk factors may be taking place at a different level in Pakistani population. and higher CHD mortality among South Asians in UK is a result of accelerated cardiovascular pathology triggered by similar factors as found in other populations but working at lower threshold levels.

8.3 Implications

8.3.1 Implications for health education in the UK

- ***Diet***

In view of direct and indirect evidence for nutritional deficiencies among certain groups of South Asians, (low birth weight, high infant mortality and rickets) the general message of decreasing fat intake and increasing fibre intake needs to be propagated with caution. In a community which is likely to have a lower level of health awareness than the general public, due to language barriers and due to religious and cultural factors the same message may have different implications. For example if a poor family, where children are already having a fairly monotonous diet, blindly tries to accept and follow the message to eat less red meat, less fat and more high fibre food, all the family members particularly children are vulnerable to become deficient in many micro nutrients. Consumption of fresh fruits and vegetables and a varied diet to ensure adequate intake of all the nutrients is probably one message of any nutrition education. In view of the growing evidence for the role of vitamin C, vitamin E and beta carotenes in checking the pathology of atherosclerosis consumption of fresh fruit and vegetables seems to be a wise and safe option.

By no means can it be said that South Asians need not worry about the fat content of their diets. The quality and quantity of fat in home cooked South Asian foods is very variable and could be modified. But South Asians need to have more comprehensive knowledge, so that they themselves could assess the amount and type of fat they are eating and the modifications required in their diets. At the present more responsibility lies with the family to assess their fat intake and if it needs modification how it could be done without any of the younger family members being negatively affected. Suggestions about including oily fish in the diet may be tried.

- ***Control of obesity***

As BMI was associated with higher levels of TBC and FBG prevention and control of obesity seems to be an important aspect of CHD health education in children.

At present the control of obesity in general, is an unresolved issue. One of the reports by the National Task Force on prevention of obesity (Obesity Research 1994) states that we are in the midst of a major shift in our understanding and attitudes about fatness. Satter 1996 reviewed current status of attitudes towards obesity and contrasted two opposing paradigms regarding attitudes towards fatness, one presently held by the National Task Force emphasising 'control' of childhood obesity and a new emerging model of 'trust' in internal regulation and the evolution of normal growth.

The current view of fatness is that it is always an unhealthful condition that can and should be prevented or treated. The goal of prevention is appropriate weight gain and that of treatment is weight loss, to be achieved by negative shifts in energy balance sustained indefinitely (Obesity Research 1994). The emerging view of obesity is that the problem is not fatness per se, but a level of fatness that is abnormal for the individual. In the emerging view, fatness is a normal condition for some people. The goal of prevention and treatment is achieving constitutionally appropriate body weight and maintaining this weight through energy homeostasis. Further, the emerging stance is that weight control programs are highly likely to destabilise normal growth processes and in the long run, may make children fatter rather than thinner (Obesity Research 1994).

The author of the commentary tends to favour the trust model and write " working with children rather than against them increases their chances of maintaining stable body weight throughout life".

The findings of the studies cited above indicate that while obesity does have genetic origins, the expression of genetic tendencies is to a certain extent related to environmental factors. Fatness does increase health risks but criteria for the assessment of fatness need to be re-established and for the prevention and treatment of obesity genetic propensities should be taken into account.

While careful assessment and cautious handling of childhood obesity is important for all the children, because of a higher degree of malnutrition, it is more so for South Asian children. Information regarding growth patterns of South Asian children and the role of genetic tendencies in fat patterning would help in identifying obesity among South Asian children. British Pakistani children were not found to be heavier than the British Caucasian children but had higher WHR. Their nutrient intakes in general were lower than that of British Caucasian children. So attempts to prevent central obesity should probably emphasise the role of physical activity in the control of weight gain.

- ***Physical activity***

In this study South Asian children particularly girls were found to be less active than the British Caucasian children. As physical inactivity is found to be associated with central obesity and increased risk for NIDDM and CHD South Asian children in general and South Asian girls in particular need to be encouraged to be more physically active. Encouragement and education to increase physical activity may also help in the prevention and control of obesity in children. Making the South Asian children aware of the links between activity, obesity, NIDDM and CHD at an early age may act as a motivating factor to alter activity habits. Involving schools and educating parents to encourage and facilitate physically active entertainment and to reduce access to sedentary behaviour is also likely to give good results. Reducing access to preferred sedentary behaviour is found to be superior to reinforcing active behaviour choices for weight control and fitness improvement (Epstein 1994).

8.3.2 Possibilities for other interventions in the UK

Local authorities and South Asian communities independently and jointly work towards propagation of health promotion campaigns.

Foods eaten with parents/at home were generally 'better' than foods eaten with friends and/or outside. Parents may be educated that traditional foods can be heart healthy. But they also need to be made conscious of the variability in fat contents and encouraged to modify recipes if required.

Children should be made aware of importance and possibilities of eating healthier foods outside home. However it needs to be appreciated that foods eaten outside and with friends have social and psychological value. Children's food choices outside their homes are found to be independent of their socio-economic backgrounds (Prattala 1988, Thomas 1991) and could be an expression of their desire to be one of the group. Foods eaten outside home with friends -chips, chocolates and crisps- are "peer" foods. Consumption of these foods appears to be a norm among children in UK, in general. (DHSS 1989) For children, eating these foods with friends may serve the purpose of maintaining identity with the peer group. They may not want to eat healthier foods if it makes them feel "different" South Asian children who already might be feeling different, may probably continue to eat 'peer' foods, even if they are aware of the nutritional disadvantages involved, because of the social importance of these foods. Recognition of this fact is crucial for the success of any relevant educational campaign. General nutrition education seems to be applicable to South Asian children as well in this regard.

Educating South Asian consumers to demand and support healthier commercial South Asian snacks and fast foods would help in increasing availability of such foods in the market. With regards to home cooked foods the South Asian needs to be educated about identifying components of atherogenic diets. Both the male and female members needs to be targeted, because males have a greater influence in determining the acceptability of foods and females are primarily responsible for food preparation and determine the composition of dishes

In view of the higher incidence of CHD and obesity in lower classes, endeavours in the direction of improving the economic status of the poor in general and of high risk groups in particular may be important. As South Asians in the UK are undoubtedly a high risk group and a vast majority of them belong to lower social classes, some improvement is possible through economic interventions. It is in the domain of socio-economic experts to find ways and means of achieving this target. It is certain that handouts are not going to solve the problem. Ensuring equal access to job opportunities and to training facilities to increase work potential may help.

Psycho-social stress is a known risk factor for CHD. Stress originating from poor economic conditions may be one of many links between poverty and higher CHD mortality. For ethnic minorities as for the majority, sources of stress are not limited to economic conditions. But fear (even if not actual) of racial, cultural and religious discrimination, fear of losing identity, anxiety about transmission of cherished values to offspring, are just a few examples of many such sources of stress which are unique to minorities. Research to find out the scope and exact nature of the problem and to devise effective social campaigns is very likely to have a broader range of positive affects.

Provision of single sex exercise and swimming facilities may get a very good response. Involving South Asian mass media for campaigns and fitness programmes on Asian TV may be helpful. These strategies can be targeted to men and children as well.

While pin-pointing the causes of higher CHD risk among South Asians is not possible with the current state of knowledge in this area, the results of this study highlight the need for further research in certain areas and also areas where improvements in diet and lifestyle could help in lowering the CHD risk of young South Asians.

8.4 Limitations Of The Study

1. There was very limited information about the nutrient contents of foods eaten in Pakistan. The database used had nutritive values of Pakistani foods as they are prepared in UK and may not be the same as they are prepared in Pakistan.

2. Collecting the required data from six very different groups of children within a limited period of time and with limited amount of human and material resources imposed certain limitations which included use of most feasible and sufficiently reliable rather than the most accurate methodology.

3. The blood testing meter used did not give specific readings if the blood cholesterol level was either below 3.8 mmol/l or above 7.75 mmol/l. It indicated "LO" and "HIGH" in these cases.

4. Information regarding the age of the children was not as accurate for children in Pakistan as it was for the children in UK. In many cases even the mothers did not know the date of birth of the child and the estimated age had to be accepted.

5. With the age range selected (10-12 yrs) there was a possibility of pubertal girls being included in the sample. The puberty status of children could not be assessed due to the modesty standards of some groups of children.

8.5 Suggestions For Further Research

The first and foremost requirement is to explore the most important modifiable factors having an associated with CHD in the South Asian community. The conclusion that established risk factors for CHD do not explain higher CHD mortality in South Asians is too simplistic. Keeping in the mind the limited number of studies done, the failure to distinguish different South Asian groups, the limitations of the nutrient databases used, the confounding effects of economic and psycho-social factors and that consideration has been given only to current diet in all the studies carried out to date, it is not surprising that links between environmental factors and disease are obscured.

1. Comprehensive, multifaceted studies, exploring the prevalence of all the known CHD risk factors may be able to explore relative impact of various factors on CHD risk status of South Asians.
2. Comparative longitudinal studies of changes in diet and exercise habits and CHD risk accompanying migration may help to provide information about impact of lifestyle changes on CHD risk.
3. Development of food frequency questionnaires for use in South Asian populations in the UK and in the subcontinent would help in facilitating data collection in further studies.
4. Animal experiments may be done to check the hypothesis that configuration of risk factors rather than specific levels of individual risk factors are responsible for CHD pathology.
5. Further research is required to assess nutrient composition of commercial and home cooked South Asian foods as they are prepared in UK and in native countries.
6. Comprehensive research on methods of cooking and serving used by families belonging to similar cultural or ethnic groups but in different social class and at different stages of the life cycle may reveal how does recipes change due to economic stress on families. This information would be invaluable in comparing food and nutrient intakes of various socio-economic groups.

7. Information is needed about food portion sizes, methods of serving and eating, utensils used for eating by South Asians and their ways of expressing food intake in order to have an accurate assessment of food intake.

8. Research is required to devise tools to assess food intake and physical activity Level of illiterate rural populations in Pakistan so that information may be obtained from large groups.

9. Research needs to be done in the area of Physical Activity to assess energy cost of various activities in South Asian children and adults.

10. Research is needed on the relationship between malnutrition, physical fitness and Physical Activity Level. It may find some common links between higher incidence of CHD in lower income group and higher CHD in adults who were exposed to malnutrition in early life.

11 A comparison of British Indian children with Indian children in India would help in testing the hypothesis presented in this study.

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APPENDICES

LIST OF APPENDICES

Appendix 1

Abbreviations

AfP	Affluent Urban Pakistani
BMI	Bodv Mass Index
BMR	Basal Metabolic Rate
BrC	British Caucasian
BrI	British Indian
BrP	British Pakistani
CHD	Coronary Heart Disease
CSO	Central Statistical Office UK
DHSS	Department Of Health And Social Security
DoH	Department Of Health
FBG	Fasting Blood Glucose
GoP	Government Of Pakistan
HDL	High density Lipo Proteins
HDL-C	High density Lipo Proteins -cholesterol
LaF	Less Affluent
LaP	Less Affluent Pakistani
LDL	Low Density Lipo Protein-cholesterol
LDL	Low Density Lipo Protein
ml	Milli Litre
mmol	Milli Mol
MUFA	Mono Unsaturated Fatty Acids
na	Not Applicable
NHLBI	National Heart, Lung And Bllod Institute, Bethesda Maryland
NIDDM	Non Insulin Dependent Diabetes Mellitus
ns	Non Significant
NSP	Non Starch Poly Saccharides
OPCS	Office Of Population Census And Surveys UK
P:S	Polyunsaturated Fatty Acids, Saturated Fatty Acids Ratio
PMRC	Pakistan Medical Research Council
PUFA	Poly-Unsaturated Fatty Acids
RrP	rural Pakistani
SD	Standard Deviation
SES	Socio-Economic Status
SFA	Saturated Fatty Acids
SMR	Standardised Mortality Ratio
SPSS	Statistical Package For Social Sciences
TBC/TC	Total Blood Cholesterol
WHR	Waist to Hip Ratio

Appendix 2

Invitation Letter To Head Teachers

5.9.94
Dear Mr.___________________

Eating Habits and Dietary Risk Factors for Coronary Heart Diseae

At the present time there is considerable concern about the eating habits of children and adolescents and the way in which these may predispose young people to cardiovascular disease in later life. In addition there is particular concern about members of the Asian community where heart disease may be four times as common as among Caucasian.

As a result we are hoping to undertake a study of young people eating habits and the relationship of these with cardiovascular risk factors. I am writing to inquire whether you would be willing to discuss the possibility of inviting some of your pupils to take part in the study.

Participation in the study would involve completing a questionnaire, keeping a food intake diary and activity diary for three days; having height, weight, hip and waist circumference measured and a skin prick test (optional) carried out for fasting blood glucose and cholesterol. Prior to the study parents' written consent would be obtained.

I hope that it might be possible to find 20-30 Asian (Pakistani) and Caucasian boys aged 10-11 at your school to take part in this study at the beginning of the autumn term.

I appreciate that this is a very busy time of year for you and your staff but it would be very helpful if you could kindly fill in the attached reply slip and send it back to me within a few days to let me know whether there is any possibility of your school taking part in this study.

Yours Sincerely,

Mrs.R.Hakeem

REPLY

Name of School ____

Please tick the appropriate response and return it in the addressed business reply envelope.

Q.1. Do you think your school would be able to take part in this study ?

a. YES Our school would be able to participate in the study and we have good representation of Pakistani and Caucasian students.

b. YES Our school would be able to participate in the study but we have very few/no Pakistani/Caucasian students.

c. YES Our school may be able to take part in the study but we would like to discuss the details with you before making a final decision.

d. NO I am sorry our school cannot participate in this study.

Q. 2 If you think your school could participate in the study when do you think is the earliest possible date at which the study could be started ?

a. Second week of September 94
b. Third week of September 94
c. Fourth week of September 94
d. First week of October 94.
e. Second week of October 94
f. Third week of October 94
g. Fourth week of October 94
h. Not certain without further discussion.

APPENDIX 2

Appendix 3

Results Of The Pilot Study

I. THE SAMPLE

Out of a total of 175 students enrolled in year six and seven, 62 girls and 52 boys volunteered to take part in the study. The majority of them were Asians; nearly 50 % of them were Indians, 40 % Pakistanis and 10 % Caucasian. All of them returned consent forms signed by their parents and most of them (102 ,90%) also gave signed consent for the blood test.

Anthropometric measurements were taken on all children. A blood test was carried out on 93 children, 9 had eaten breakfast or were absent on the blood testing day, so could not be included. Most of the participants completed questionnaires; diaries were returned by 78 children and out of them 49 were good enough for analysis. Parents' questionnaires were returned by only 62 children. At the end there were 31 cases for whom all the information was available. The resulting sample was very imbalanced in terms of representation of sex and ethnic groups, so a few more cases, although some of the information were missing for them were included in integrated analysis. Sex and ethnic distribution of the initial sample and the subgroup studied in detail is given in table 1a and 1b. i.e 22 girls and 19 boys.

From the smaller group only 28 diaries were available for the analysis. No usable diaries were available from Caucasian boys In general girls were found to be more responsive

Characteristics of the participants parents.

Most of the fathers were factory workers and mothers were housewife; the parents of the majority of Caucasian, Indian and Pakistani children were born in England, India and Pakistan respectively The mean length of residence in UK for Indian fathers and mothers and Pakistani fathers and mothers were, 23 9 & 17 4, and 24 0 & 18 0 respectively.

Most of the mothers from each ethnic group were housewives, and the majority of the Pakistani, and Caucasian fathers were unemployed, and the majority of the Indian fathers were factory workers

II. DIETARY HABITS OF CHILDREN.

Data is available both from diaries and questionnaires.

Frequency of Food Consumption (from questionnaire).

Differences were noted in the pattern of food consumption among the six sex and ethnic groups. Differences between the ethnic groups in some cases seems to be more marked than the differences among the two sexes within the same ethnic group. For example consumption of chapattis, peas, beans and lentils, vegetables, vegetable oil, fish and Pizza was high in both the sexes of Pakistani and Indian groups; and consumption of meat and meat products was lower among Indians and Pakistanis than among Caucasian

Consumption of chips, crisps, biscuits, sweets and chocolates , baked beans and yoghurt was moderately high with some differences within each sex and ethnic group.

Consumption of vegetable pasties, vegetable burgers, boiled, mashed or jacket potatoes, nuts and past was generally low.

Consumption of fresh fruits, ordinary white bread and ordinary milk was high among the Pakistani girls and boys.

Nutrient intake of Children

The mean nutrient intake of the six sex and ethnic groups in given in table 4a-4e

In general the intake of most of the nutrients (energy, protein total fat, retinol) was lower than national averages (DHSS 1989)

Nutrient intake for nearly all the nutrients was found to be low among the boys in comparison with girls; the reason might be more responsible recording by the girls.

The intake of saturated fats, iron, retinol eq carotene eq , vit D, and dietary cholesterol was low and of MUFA, PUFA, vat C, Vat E was higher among the Caucasian girls as compared to Indian or Pakistanis

It is also possible to look at the eating patterns from the dietary data and to link it with anthropometric and biochemical indices

III. PHYSICAL ACTIVITY PATTERN OF CHILDREN

Time spent in various activities

Time spent in school activities was more for Caucasian girls because two of them had not completed records for weekend day. This may be the reason for differences in some other activities also e.g. less time spent in study at home, T.V viewing, and more in active games and walking.

Both for Pakistani and Indian boys, the average time spent in sleeping or lying, eating, T.V viewing, dressing and grooming and chores was less and time spent in active games and light games and walking was more than the girls of the same ethnic group.

The activity records need to be analysed separately for weekdays and weekend days to give a clear picture of differences in activities.

Caloric expenditure per day

Mean caloric expenditure per day was found to be higher for the girls than the boys in the two ethnic groups (Pakistani & Indian . no usable records were available for the third group)

Mean energy balance was negative for both the groups of boys, and positive for all the three groups of girls.

It was realised that the tables used for calculating energy expenditure gave higher values, and the newer tables (James Schofield 1990) would serve the purpose better.

FAMILY DISEASE HISTORY.

The majority of the children had a positive family history for either diabetes or heart disease. However more Pakistani (72%) and Indian(70%) children had a positive family disease history than Caucasians(60%)

The maximum number of relatives reported by Pakistani, Indian and Caucasian parents, to be having or had either CHD or Diabetes was 4.2 & 2 respectively

Anthropometry and blood test.

Height, weight and waist:hip ratio

Mean height of Indian and Caucasian boys was similar (146.50 cms and 146.20 respectively) and more than the mean height of Pakistani boys(144.27 cms).Among the girls the situation was reversed. Pakistani girls were the tallest followed by Indian and Caucasians (mean height, 145.70,145.27 and 145.59 respectively).

Pakistani boys were found to be the heaviest, followed by Indians and Caucasians; while Pakistani girls were the lightest and the Caucasian girls the heaviest.

Pattern of differences in the heights and weights were reflected in the pattern of differences in BMI Caucasian girls had the highest mean BMI, followed by Indians and Pakistanis. Among the boys Pakistani boys had the highest BMI followed by the Indians and Caucasians.

Apparently BMI did not appear to be closely related to the waist:hip ratio. For example Pakistani boys had higher BMI than the Caucasians but the Waist:hip ratio was the same. Indian girls had BMI lower than the Caucasians but higher mean value for waist:hip ratio. Higher proportion of Pakistani boys had BMI above 25 than the Indian.

Blood test

Caucasian girls and boys had higher mean values for blood glucose than the Indians or Pakistani. Higher proportion of Pakistani and Indian boys had blood cholesterol values above 5.2 mmol/l.

IV. HEALTH ATTITUDES AND BELIEFS

Results indicate that boys more often thought themselves to be responsible for their health than the girls. In response to the statement "I am in-charge of my health 57 % of the boys and 36 % of the girls indicated agreeing to it Forty percent of the girls and 21% of the boys agreed to the statement that they have just been lucky if they are healthy

In response to the question how often they consider health while selecting food, a higher proportion of children within each age and sex group mentioned sometimes, and 3% of the Pakistani girls never considered health while selecting food

SELF CONCEPT ABOUT FITNESS,ACTIVENESS AND WEIGHT

Fifty seven percent of the boys and 54 % of girls thought themselves to be unfit. More girls thought themselves to be active than boys. Although in both sexes the majority was happy with their weight the percentage was higher for girls and among both the sex groups majority of those who were unhappy with their weight wanted to lose rather than gain weight.

IDEAS ABOUT FOOD

Favourite foods

Red meat or its products were the favourite foods of the majority of Caucasian boys and girls only. Among the Pakistani and Indian children chips were liked by the majority of the boys and girls.

Chips and fruits were the second most often liked food among the Caucasian boys and girls. Fruits and white meat were also liked by majority of Pakistani children while majority of Indian boys and girls also liked fruit and sweets. Minor differences were observed among the sexes within each group.

Disliked Foods

Vegetables were the most disliked food among all the sex and ethnic groups.89% of the girls and 72% of the boys mentioned them as their disliked foods. Meat also was not liked by 50 and 37 percent of Indian and Pakistani boys and 57% of Pakistani girls.

Never Eaten Foods

Meat (red and white or both) and its products were the foods never eaten by the majority of Indian and Pakistani children, minor within group differences were noted. The majority of Pakistani and none of the Indian girls never ate red meat. Among the boys red and white meat was disliked with similar frequency by Pakistanis, while Indians mentioned never eating red meat more often than the white meat.

8. Reasons for likes, dislikes and avoidance of foods.

Good taste was the main reason given for liking food by all the six subgroups of children. Caucasian boys however seemed to be equally interested in the foods' looks

Bad taste and general dislike were the main reasons for dislike and avoidance of food respectively. However Pakistani boys and girls were influenced more by their family's eating habits and religion than any other group.

3.Cardiovascular nutrition knowledge

Mean nutrition knowledge was higher for girls in general (all the ethnic groups combined). Within the six sex and ethnicity groups Caucasian boys scored the highest followed by the Indian girls. Mean score was the lowest for Pakistani boys.

Majority of the children from each group knew that cholesterol comes from animal food, apple and corn oil are better than pot roast and ghee respectively for prevention from heart disease, and that high blood pressure usually accompanies heart disease. They all in general were not sure about stress being a major cause of heart diseases.

V. MODIFICATIONS IN THE RESEARCH TOOLS AFTER THE PILOT STUDY

1.THE SCHEDULE.

As the return rate for parent questionnaires was low in the pilot study, and many of the otherwise complete responses could not be included in the integratd analysis; the parent questionnaires were sent along with the introductory letter to the parents, so that they could have a better idea of what is involved; parents were requested to return the completed questionnaires alnogwith the consent form if they agreed for their son to take part in the study. This order saved time and avoided wasted efforts

In the pilot study the blood test was done before the filling of diaries; and again as the return rate and acceptability of the diaries was not very good results of the blood test and anthropometry could not be correlated with the information from the diaries. So in the main study blood test and anthropometry was scheduled after the three day food and activity records were completed Student questionnaires were also completed before the blood test and anthropometry

2.Students Questionnaires

1 In the pilot study the school concerned was not able to provide an opportunity for the questionnaires to be filled in the presence of the researcher All the six classes involved filled

the questionnaires in their classes at the same time in the presence of their class teachers. Although directions were given to the teachers involved about the administration of the questionnaires; the researcher was present in the school at that time answer any further queries and visited the classes but it was observed that in this set up effect of external factors was great on the student's responses and proportion of questionnaires returned unfilled or partially filled was more than expected.

So for the main study , the head teacher, co-ordinators and teacher involved were strongly requested to arrange for any suitable place and time where the questionnaires could be completed by the students in the presence of the researcher. Furthermore , as differences in reading ability were found to be having effect on responses, questions were loudly read in the hall/class to the students. It helped in maintaining the formality of the environment and individuality of the responses. It also helped in clarifying the general expected queries to every one.

2.Changes were made in the nutrition knowledge questions. Questions better adapted to the age level of children were extracted from nutrition teaching packages prepared for the age group , and were included in the questionnaire.

Questions about usual daily activity pattern were included to cross check the validity of the three day records and to have some information of this aspect in case the diaries are not returned or are not acceptable.

3. To improve the return rate and quality of the three day record the layout was made a bit more user friendly, coloured pages were used to make it appealing, and the children were promised a certificate if they complete all arts of the study, including the diaries successfully.

4 In order to get better assurance of the fasting state of the children an explanatory letter was sent to the parents and they were requested to return a signed statement about the fasting state of the child. As it was found that few of the children felt weak and dizzy after the test and it was not feasible for the school to provide breakfast individually soon after the test, children were offered sweets immediately after the test.

As the number of children willing to participate in the blood test was much higher than could be done in the maximum time which Schools could allocate for this procedure. two blood testing machines were used simultaneously with the help of an assistant

VI. FUTURE PLANS

Future plans are to carry similar studies in the urban and if feasible in rural areas of Pakistan. Within the Urban area two separate cohorts of affluent and less affluent children will be studied. Some changes in methodology would be required for making the tools applicable in the rural areas.

Appendix 4a

Letter To The Parents

Date__________

Dear Parents

As you may be aware there is growing concern in this country about the possibility that the diet and activity pattern of children may be increasing their risk of heart disease later in life.
Your son's school has agreed to take part in a research study which will explore this problem and I hope that you will be willing for your son to participate in the study.
The study will involve collection of information about the boy's diet and physical activity and we will be looking at how these habits are related to heir health. The participants will fill out a questionnaire in class, and some of their body measurements will be taken at the same time (height, weight, waist and hip circumference). They will also be asked to keep a three day record of their food intake and physical activity. A skin prick test will also be carried out to assess blood glucose and cholesterol. Volunteering for blood test is not compulsory part of the study. Those participants who do not wish to have skin prick test done can participate in the rest of the study. For the skin prick test the volunteers will be required to come to school without breakfast. Breakfast will be provided after the test.

Although boys may of course opt out of this skin prick test and still take part in the rest of the study, we hope that as many as possible will be willing to undergo this relatively painless procedure, which will provide vital information.

I hope that you will be willing to complete a questionnaire about eating habits of young boys in past and at present.

All the information obtained will be kept confidential. Results of the blood test will be provided to the students.

If you are willing for your son to participate in the study please sign the consent form attached and return it to the class teacher soon as possible.

I shall be really thankful for your cooperation.

sincerely yours,

Rubina Hakeem

Research Student

Appendix 4b

CONSENT FORM

for diet and health survey by Mrs. Rubına Hakeem
at King's College , Unıversity of London)

I understand the procedures involved in this study and I give consent for_____________________________ child's name) who is a student of class__________at __________________________________school to take part in the study .

signed______________________

(parent/guardian)

date__________________________

I also gıve my consent for having my childs blood test done

sıgnea______________________

parent/guardian

date__________________________

Appendix 5

King' College, University of London
Department of Nutrition and Dietietics

FOOD and ACTIVITY RECORD DIARY

NAME ______________________________
SCHOOL ____________________________
DATE ______________________________

THANKYOU FOR YOUR HELP IN THIS SURVEY

For the next few days (Thursday Friday and Saturday) please write down whatever you eat, drink and do immediately in this diary. It means the diary should always be in your pocket ! with pencil o*course.

Whenever you eat or drink anything

i) *note the time,* ii) *write whatever you ate,* iii) *mention how much you ate, iv) where you ate and* v) *with whom you ate*

While writing all this please remember that it is very important that you....

- enter each food in a new line
- mention parts of mixed foods separately (like for cheese and tomato sandwich write cheese, tomato and bread separately)
- don't forget to describe the food (like for cooked foods whether it was fried baked or boiled or curried, for milk whether it was whole, skimmed or semi-skimmed, for bread chapatti and cereals whether they were they were whole wheat high fibre or white, for tea or coffee mention how much milk and sugar was in it
-
- ____
-
- and write the amount eaten very carefully by indicating number and size of serving. Like if you drink orange juice it may be one small glass or one 200 ml carton , one is the number of serving and small glass or 200 ml carton is the size of serving So for each food item please mention the number as well as the size of serving.
    * for the foods mentioned in whole numbers like apple or toast please mention whether it was large, medium, small thin or thick
    * for foods eaten as piece or wedge mention the size in centimetres.
    * for food taken from main serving dish mention the number of serving spoons as well as whether it was leveled or heaped
    * if you are writing amount eaten as plate or bowl or table or tea spoon please mention whether it was heaped or leveled

<u>How much food/drink your utensils can hold ?</u>

Please give here some information about the amount of food or drink your utensils can hold. Measure the amount of water your utensils can hold (with the help of beaker provided) or size (with scale) of the utensils you normally use for eating and drinking and write down the reading below.

My glass can hold __ml of water

My cup can hold __ml of

My Bowl can hold ___ml of water

My deep plate can hold ___ml of water

My serving spoon can hold ___ml of water

My tablespoon can hold ___ml of water

My teaspoon can hold ___ml of water

My flat plate is ______ cms wide

How to fill the activity part ?

When you get up on Thursday morning see what time it is and at the nearest time in your dairy write woke up. Then what else you did during that fifteen minute block, write it there. Like if you got up at 8.15 and then remained lying in your bed till 8.30 you would write *"got up lying in bed"* .Later in the day when you might be doing same things for long periods write the activity when you start it and then keep on putting ditto marks (") in next lines until you start doing something else .

While writing your activities try to be very specific If you were working or playing write what the work or play was If you were in friends house don t just write "in friend's house" instead write whatever you were doing at friend's house

(Specimen of food record blanks)

THURSDAY

Time	DESCRIPTION OF FOOD AND DRINK (ENTER EACH ITEM ON A NEW LINE)	AMOUNT EATEN	WHERE EATEN	WITH WHOM	LEAVE BLANK WT	CD

(Specimen of activity record blanks)

Thursday (Morning)

Time	ACTIVITY	[illegible]	Time	ACTIVITY	[illegible]
6am			9am		
6.15			9.15		
6..30			9..30		
6.45			9.45		
7pm			10pm		
7.15			10.15		
7.30			10.30		
7.45			10.45		
8.am			11pm		
8.15			11.15		
8.30			11.30		
8.45			11.45		

(TO BE FILLED BY PARENTS)

- **Please indicate which type of the following items your child usually drinks or eats ?**

1.Milk as drink......whole semi skimmed/skimmed/any other
2.Milk in tea........whole semi skimmed/skimmed/any other
3.Milk with cereals..whole semi skimmed/skimmed/any other
4.Bread rolls etc...white wholewheat any other
5.Chapatti made with..white flour wholewheat flour any other
6.Pitta bread/naan..white brown/any other
7.Meat.............beef mutton/lamb ham any other
8.Spreading fats....butter margarine polyunsaturated margarine
*any other*______________________________

- Please fill in the blanks and circle the relevant options in the following statements about your child's eating habits ?

He/she eats_____thick/thin/medium slices of bread at breakfast
He/she eats__________bowl of ___________cereal at breakfast
He/she drinks__________glasses/cups of milk at breakfast
He/she puts_______teaspoon of sugar in each cup of tea
He/she puts_______tablespoon of milk in each cup of tea
He/she puts_______teaspoon of sugar in each cup/glass of milk
He/she usually eats chapattis at a meal
The chapattis he/she usually eats are made with fat/without fat

Dear Parents

Thank you for giving your consent for your child to take part in the diet and health survey / CHD risk factor study. In connection with this study your child needs to keep a three days record of his/her diet and activity. I shall be very thankful to you if you could kindly supervise your child while he/she is keeping the records.

All the children participating in this study are given food and activity record diaries in which they would write the records. Directions for keeping the records are given in the beginning of the diary. Before starting to write food intake children need to measure capacity of the utensils they normally use for eating and drinking. This information is very important for assessing the child's food intake. So I would request you to please guide your child while he/she is doing this.

For each day there are four pages for writing food intake and four pages for writing the activities. The main points to be emphasised for food and activity records are as follows.

FOOD RECORDS

1.Everything eaten or drunk should be entered.

2.Each item should be written on a new line.

3.Food type should be described in sufficient detail e g. type of bread, meat, milk, biscuits, cakes etc; whether the food was boiled, baked , fried etc;

4 While writing the amount eaten no and size of servings should be indicated.

ACTIVITY RECORD

1.No time period should be left blank.

2.While writing the activity for the first time it should be written in full.

3.What the work or play was should be written very specifically e.g. if the child was playing football he should write played football and should not just write playing Similarly if he/she came to school by car he/she should write "came to school by car" rather than just writing "came to school".

4 It doesn't matter where the child was so it should not be written that he was in friend's house or relatives' house. Instead whatever he/she was doing is important so he/she should write what he/she was doing no matter where he/she was.

I appreciate that this supervision would be an addition to your responsibilities and hope that your child would be able to keep the records with the minimum of help.

Thanking you

Sincerely yours

Mrs Rubina Hakeem

Appendix 6

QUESTIONNAIRE TO PARENTS

Dear Parents

It was really kind of you to give your consent for your child to take part in the Coronary Heart Disease risk factor study.

In connection with the same study it would be very valuable if you could provide some information about your child's family background and your ideas about children's health. I would greatly appreciate if you could spare a few minutes to fill out the attached questionnaire. The information thus obtained will not be stored or used on an individual basis and will be treated as completely confidential.

Thanking you for your cooperation

Sincerely yours,

Rubina Hakeem

Child's name ______________________

Date of birth ______________________

Please get the questionnaire filled by your mother (if you are a girl) and by your father (if you are a boy).

Q.1 Do you think that certain foods are good for boys and certain foods are good for girls?

a. yes b. no c. don't know

Q.2 Do you think there are any foods which are ESPECIALLY GOOD for BOYS ?

a. yes b. no c. don't know

If yes which food do you think are especially good for boys ?

____

Q.3. Do you think there are any foods which are ESPECIALLY GOOD for GIRLS ?

a. yes b. no c. don't know

If yes which food do you think are especially good for girls?

____

Q.4. Do you think there are any foods which are ESPECIALLY BAD for BOYS ?

a. yes b. no c. don't know

If yes which food do you think are especially bad for boys ?

____

Q.5. Do you think there are any foods which are ESPECIALLY BAD for GIRLS ?

a. yes b. no c. don't know

If yes which food do you think are especially for girls?

____

Q.6. When you were 10-12 years old did you ate similar kind of foods as eaten by your 10-12 year old son/daughter these days?

a. yes b. no c don't know

If no, please mention

a. the foods you used to eat less often than your son/daughter does these days

____

b the foods you used to eat more often than vour son/daughter does these davs

____

Q 7. When food choices are being made at your home whose likes and dislikes are considered most important ? (please tick one answer only)

a. Father b. Son c. Grand father

d. Mother e. Daughter f. Grand mother

g. Any other (please specify)______________________________

Q.8. When you were 10-12 years old do you think you were more or less active than is your 10-12 year old son/daughter these days?

a. less active b. more active c. were the same

If not the same please mention,

a. those activities which you undertook more often than your 10-12 year old son/daughter ?

____

b. those activities which you undertook less often than your 10-12 year old son/daughter ?

____

Q.9. Please give the following details about your household.

Family Member	Age	Place Of Birth	Occupation	Length Of Residence In UK	Religion	Education
Father						
Mother						
Son						
"						
"						
"						
Daughter						
"						
"						
"						
Any other						

Q.10. Do any member of your child's immediate family (parents and siblings) or first degree relatives(parent' parents and parents' siblings) have or ever had diabetes or heart disease.

yes no don't know

If yes please give the details below.

Please tick the appropriate box.

Relation	Alive	Dead	Have or had Diabetes	Have or had CHD	Have or had C.H.D & Diabetes

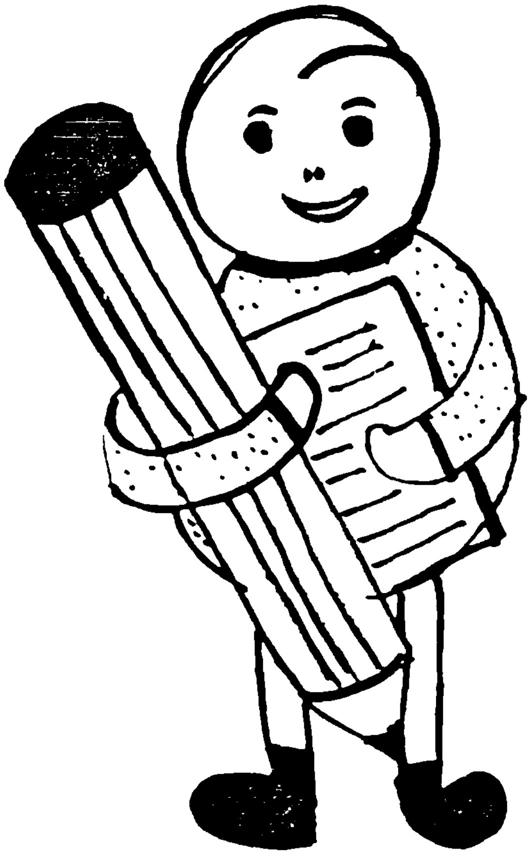
Appendix 7

Heart Disease Risk Factor Study

Health Related Behaviour Questionnaire

for national curriculum year 6 and 7 children

Name______________________________
Date of birth________________________
Class______________________________
Date______________________________
School_____________________________



Department of Nutrition and Dietetics
King's College. University of London
R.Hakeem 1994

CARDIOVASCULAR NUTRITION KNOWLEDGE QUESTIONNAIRE

Q.1 Look at the following three pairs of foods. Which one do you think would be a better choice for protecting ourselves from heart diseases ? (*please circle one food from each pair*)

- i. *apple................................apple pie*
- ii. *whole milk.......................skim milk*
- iii *butter.............................. polyunsaturated margarine*

Q.2 Which of the following may increase a person's risk of having a heart attack ? *(please circle as many answers as you think to be correct)*

- *a. Too much stress*
- *b. Eating vegetables*
- *c. Smoking cigarettes*
- *d. Hard work*
- *e. Eating too much fat*
- *f. Being overweight*
- *g. Lack of exercise*
- *h. Drinking tea*

Q.3 Are the following statements are true or false ?

- *a. Bread, potatoes and pasta are fattening Food................................ True False*
- *b. Butter contains more calories than margarine..................................True False*
- *c. Weight for weight fat contains more calories than carbohydrates.....True False*
- *d. Fibre is obtained from both animal and vegetable foods..................True False*
- *e. Fibre is lost during cooking. ....True False*
- *f. A person can increase fibre in the diet by adding fruit..................... True False*

Q.4 Which of the following fats is not good for health ?

- *a. Saturated fat*
- *b. Poly unsaturated fat*

Q.5 Which of the following contain saturated fat ? *(please circle as many answers as you think to be correct)*

- *a. Whole Milk*
- *b. Cheddar Cheese*
- *c. Corn Oil*
- *d. Cod Liver Oil*
- *e. Sunflower Oil*
- *f. Lard*
- *g. Ghee*
- *h. Dairy Cream*

Q.6. Which of the following is the biggest source of fat amongst people your age ? *(please circle one answer only)*

- *a. Biscuits*
- *b. Chips*
- *c. Milk*
- *d. Ice cream*

(GENERAL QUESTIONNAIRE)

Q.7. Which are your three favourite foods ?

1.________________ 2.________________ 3.________________

Q.8. Which three foods do you dislike the most ?

1.________________ 2.________________ 3.________________

Q.9. When choosing what to eat, do you consider its price ?

a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q. 10 When choosing what to eat, do you consider your religion ?

a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q.11 When choosing what to eat, do you consider your health ?

a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q.12 When choosing what to eat, do you consider what your mother would want you to eat ?

a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q.13 When choosing what to eat, do you consider what your father would want you to eat ?

a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q.14 When choosing what to eat, do you consider what your friends are eating ?

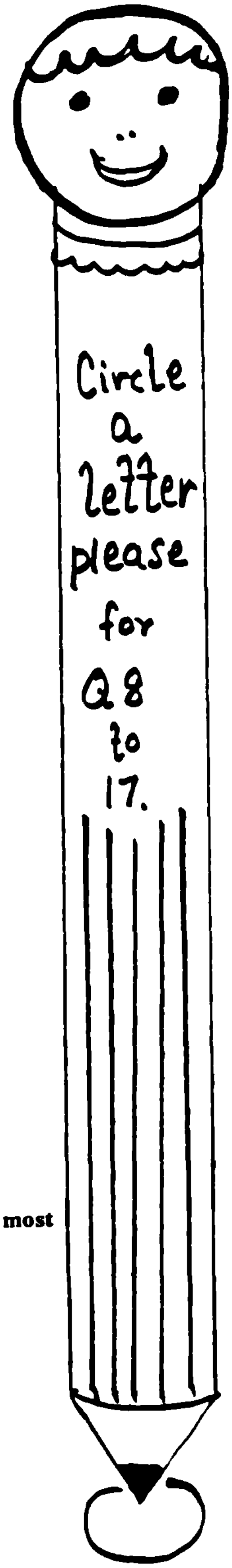
a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q.15 When choosing what to eat, do you consider how the food tastes ?
a. Never b. Sometimes c. Quite often
d. Very often e. Always

Q.16 When choosing what to eat, do you consider how the food looks ?
a. Never b. Sometimes c. Quite often
d. Very often e. Always

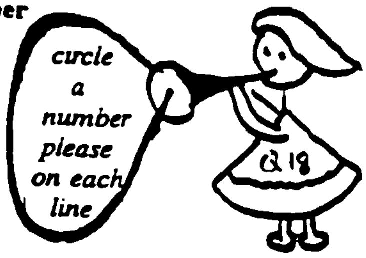
Q.17 When food choices are being made at your home whose likes and dislikes are considered most important ? (tick one answer only)

a. Father b. Brother c. Grandfather
d. Mother e. Sister f. Grandmother
g. Any other (please specify)____________________



.18 **Please study each item in this list of foods, decide how often you eat them or things made from them and circle a number**

KEY: 0=Rarely or never,
1=Less than once week,
2=At least once a week,
3=On most days.



	Rarely or never,	Less than once week	At least once a week	On most days.
amb, Beef, Pork etc	0	1	2	3
'oultry (Chicken, etc)	0	1	2	3
'egetarian Pastis, Samosa	0	1	2	3
Aeat pastis, Pies, Samosas	0	1	2	3
'egiterian Burger/Sausage	0	1	2	3
Aeat burger or Sausages	0	1	2	3
)nly Fish (e.g. Mackerel)	0	1	2	3
)ther Fish or Fish finger	0	1	2	3
ggs	0	1	2	3
)rdinary Milk	0	1	2	3
emi or Skimmed Milk	0	1	2	3
oya Milk	0	1	2	3
Yogurt	0	1	2	3
Low fat Cheese	0	1	2	3
Other Cheese	0	1	2	3
Low-fat Margarine	0	1	2	3
Butter or Margarine	0	1	2	3
Ghee	0	1	2	3
Vegetables oils	0	1	2	3
High fibre white bread	0	1	2	3
Ordinary white bread	0	1	2	3
Wholemeal bread	0	1	2	3
Chapatti flour	0	1	2	3
Maize flour	0	1	2	3
Rice	0	1	2	3

	Rarely or never,	Less than once week	At least once a week	On most days.
Boiled or mashed Potatoes	0	1	2	3
Jacket Potatoes	0	1	2	3
Chips or Roast Potatoes	0	1	2	3
Yams	0	1	2	3
Pastas	0	1	2	3
Sugar coated Cereal	0	1	2	3
High Fibre Cereal/Muesli	0	1	2	3
Other Cereal	0	1	2	3
Ice cream	0	1	2	3
Baked Beans	0	1	2	3
Peas, beans or Lentils	0	1	2	3
Tofu	0	1	2	3
Nuts	0	1	2	3
Plantains	0	1	2	3
Vegetables	0	1	2	3
Salads	0	1	2	3
Pizza	0	1	2	3
Fresh fruit	0	1	2	3
Fruit juices	0	1	2	3
Low-calorie drink(e.g.diet coke)	0	1	2	3
Fizzy drink (not low calorie)	0	1	2	3
Biscuits, Cakes or Tarts	0	1	2	3
Crisps	0	1	2	3
Sweets, Chocolates, Choc bars	0	1	2	3
Asian sweets(Mithai)	0	1	2	3
Sugar added to hot drinks	0	1	2	3

Q.19 **What did you have for breakfast this morning ? (circle as many responses as you think to be correct)**

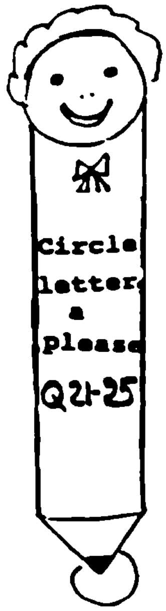
a. Nothing at all
c. Drink of milk
d. Fruit juice
e. Tinned or fresh fruit
f . Toast or bread
g. Cereal (please describe) ____________________
h. Cooked breakfast (please describe) ____________________
i. Something else (please describe)____________________

Q.20 **What did you do for lunch Yesterday ?(circle as many responses as you think to be correct)**

a. Had cafeteria lunch in School
b. Had set lunch in School
c. Ate a packed lunch
d. Bought lunch from a take-away or shop
e. Went home for lunch
f. Did not have any lunch

Q.21 For someone of your age and sex, how active do you think you are ?

a. Very inactive b. Inactive c. Moderately inactive
d. Active e. Very active



Q.22 How fit do you think you are ?

a. Very Unfit b. Unfit c. Moderately unfit
d. Fit e. Very fit

Q.23 Which statement describes you best ?

a. I would like to put on weight.
b. I would like loose weight.
c. I am happy with my weight as it is.

Q.24 Are you currently trying to gain weight ?

a. Yes b. No
c. If yes, How ?________________________________

Q.25 Are you currently trying to lose weight ?

a. Yes b. No
If yes, How ?________________________________

Q.26 How much do you agree or disagree with the following statements ?

Key: 0 = Disagree 1 = Not sure 2 = Agree

	Disagree	Not sure	Agree
a. I am in charge of my health	0	1	2
b. If I keep healthy, I have just been lucky	0	1	2
c. If I take care of myself, I'll stay healthy	0	1	2
d. Even if I look after myself , I can still fall ill	0	1	2

Q.27 Which statement describes you best ?

a. I don't smoke now and I never will
b. I don't smoke now but I may when I am older
c. I smoke but would like to give up
d. I smoke and don't want to give up

Q.28 How many people smoke on most days in your home ?

Please write the number including yourself if you smoke______

Q.29 Which foods do you think are good for boys and girls of your age ?

____

Q.30 Which foods do you think are bad for boys and girls of your age ?

____

Q.31 Now thinking only about BOYS do you think there are any foods which are SPECIALLY GOOD for BOYS ?

a yes b. no c. don't know

If yes which foods do you think are specially good for boys ?

____

Q.32 Now thinking only about GIRLS do you think there are any foods which are SPECIALLY GOOD for GIRLS ?

a yes b. no c. don't know

If yes which foods do you think are specially good for girls?

____

Q.33 Again thinking only about BOYS do you think there are any foods which are SPECIALLY BAD for BOYS ?

a yes b. no c. don't know

If yes which foods do you think are specially bad for boys ?

____

Q.34 Now thinking only about GIRLS do you think there are any foods which are SPECIALLY BAD for GIRLS ?

a yes b. no c. don't know

If yes which foods do you think are specially for girls?

____

Q.35 At what time do you usually get up ? (please write time in blanks)

I get up at__________on weekdays and at__________on weekend days

Q.36 At what time do you usually go to bed ? (please write time in blanks)

I go to bed at_________on weekdays and at_________on weekend days

Q.37 How do you travel to and from school on most day ? *(please circle one answer only)*

a. I walk to and from school
b. By car
c. By' bus
d. A.iy other____________________

Q.38 Besides getting ready for school what else do you do on most days before coming to school ? (circle as many responses as you think to be correct)

a. Have Breakfast
b. Iron uniform
c. Any housework (please describe)____________________________
d. Any exercise (please describe)____________________________
e. Anything else (please describe)____________________________

Q.39 **What do you usually do in your play time at school ?**

____

Q.40 **Besides eating lunch, what else do you do in your lunch time at school ?**

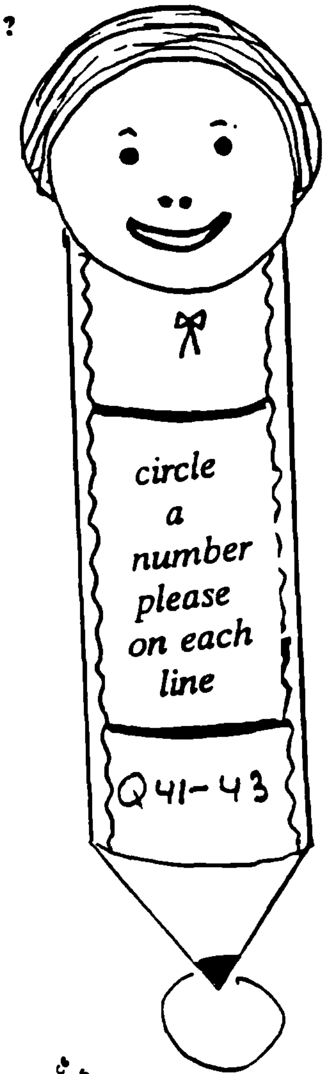
____

Q.41 **How much time do you usually spend doing each of this things below after school ?**

Key: 0=No time at all
1=upto one hour
2=upto two hour
3=upto three hour
4=more than three hour

No time at all / Upto one hour / Upto two hour / Upto three hour / More than three hour

a. Watching T.V./video/playing video games............0 1 2 3 4
b. Reading/ writing/ drawing/ painting 0 1 2 3 4
c. Playing cricket/ hockey football............0 1 2 3 4
d..Cooking /cleaning/ laundry / ironing............0 1 2 3 4
e. Sitting leisure activities like watching T.V, video, sitting games, reading magazines, novels etc............0 1 2 3 4
f. Doing School Home Work............0 1 2 3 4
g. Running games like football, cricket, hockey etc............0 1 2 3 4
h. Doing housework like cooking, cleaning, laundry etc.......0 1 2 3 4
i. Praying/ religious activities............0 1 2 3 4



Q.42 **How often do you undertake the following activities ?**

Key: 0=never
1=once or twice a year
2=once or twice in a month
3=weekly
4=twice a week or more

Never / Once or twice a year / Once or twice in a month / Weekly / Twice a week or more

a. Visiting relatives............0 1 2 3 4
b. Visiting Asian friend............0 1 2 3 4
c. Visiting English friends............0 1 2 3 4
d. Reading Urdu, Punjabi or Hindi books............0 1 2 3 4
e. Reading English books............0 1 2 3 4
f. Watching Urdu, Punjabi or Hindi movies............0 1 2 3 4
g. Going to religions school............0 1 2 3 4
h. Watching English programmes on T.V............0 1 2 3 4
i. Watching Asian programmes on T.V............0 1 2 3 4

Q.43 **Have you ever suffered from any of the following diseases ?**

Key:0=never suffered
1=suffered in past once or twice
2=suffered in past many times
3=suffer now sometimes
4=suffer now quite often

Never Suffered / Suffered in past once or twice / Suffered in past many times / Suffer now sometimes / Suffer now quite often

Asthma............0 1 2 3 4
Diabetes............0 1 2 3 4
Anemia............0 1 2 3 4
Measles............0 1 2 3 4
Sore throat with fever............0 1 2 3 4
Joint pain............0 1 2 3 4

Q.44 Are you taking any medicines thesedays ?

a. yes **b. no**

If yes please give the details below.
Name of the medicine______________________________
Dosage______________________________
Since how long______________________________

Q.45. Does anyone in your family or relatives has (or ever had) diabetes?

a. yes **b. no** **c. don't know**

If yes please mention their relationship to you

1.______________________________ **2.**______________________________
3.______________________________ **4.**______________________________

Q.46. Does anyone in your family or relatives has (or ever had) heart disease ?

a. yes **b. no** **c. don't know**

If yes please mention their relationship to you

1.______________________________ **2.**______________________________
3.______________________________ **4.**______________________________

Q.47 Which of the following describes you best ?
a. British
b. Pakistani
c. Indian
d. Any other (please write)____________________

Q.48 Where were you born ?
Town________________Country______________________

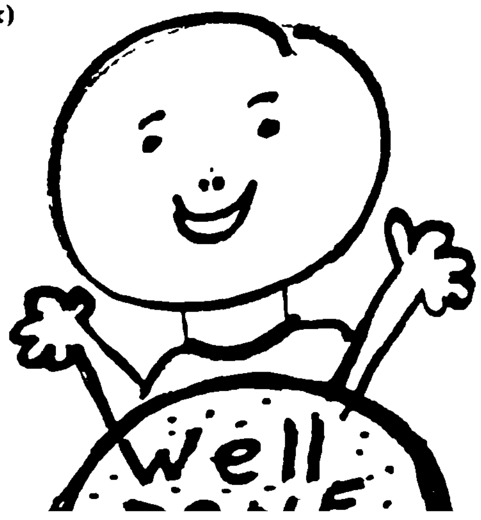
Q.49 What is your religion ?

a. Muslim
b. Hindu
c. Sikh
d. Christian
e Any other (please write)______________________________

Q.50 How well do you know these language ?(*please tick the appropriate blank*)

	English	**Urdu**	**Punjabi**	**Hindi**
a. I cannot speak at all	____	____	____	____
b. I can speak a little bit	____	____	____	____
c. I can speak fluently	____	____	____	____
d. I can write it	____	____	____	____
e. I can read it	____	____	____	____

THANK YOU!



Appendix 8: Method of Calculating PAL

1) From the activity diary (recorded for each 15 minute intervals) activities were recoded according to their PAR (Schofield 1991). Following this the total time spent (in hours) within twenty four hours in activities of differing PAR was calculated.

2) BMR/hr was calculated by dividing the whole day BMR (calculated by Schofield equation) by 24.

3) Energy expenditure for each activity was calculated by multiplying the estimated BMR/hr of the subject by PAR value of the activity and then multiplying the resulting value by the number of hours spent in that activity.

4) Total energy expenditure (TEE) for the whole day (24 hours) was calculated by adding together the estimated energy expenditure for each activity.

5) PAL was calculated by dividing the TEE by BMR.

Appendix 9: Raw data for age, sex and anthropometric and blood measurements.

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
1	134	BrP	G	141.2	31.2	54.0	72.0	5.50	6.89
2	126	BrP	G	144.6	47.2	72.0	85.0	4.80	5.02
3	131	BrI	G						
4	126	BrC	G						
5	124	BrI	G						
6	132	BrI	G	143.2	37.4	61.5	78.0	4.50	4.68
7	127	BrP	G	141.0	30.8	57.5	71.5	4.50	3.80
8	128	BrP	B						
9	134	BrP	B						
10	125	BrP	B						
11	126	BrP	B	144.5	31.6	58.0	70.0	4.80	3.80
12	130	BrP	B	146.8	51.6	71.0	89.0	5.30	4.62
13	131	BrI	B						
14	131	BrP	G	148.5	34.0	56.0	73.0	3.50	4.13
15	126	BrP	G	140.3	30.4	64.0	71.0	5.70	3.80
16	132	BrP	G	148.9	45.8	68.0	84.0	4.80	4.93
17	126	BrP	B						
18	128	BrP	B						
19	130	BrC	B	159.3	43.0	63.0	78.0	5.00	3.80
20	126	BrI	B	142.2	44.0	72.0	81.0	5.20	5.48
21	128	BrP	B						
22	134	BrI	B	142.5	44.0	70.0	81.0	5.10	5.17
23	132	BrP	G	151.8	38.8	61.0	79.0	4.20	4.62
24	133	BrC	G	143.9	48.0	68.0	88.0	4.30	4.68
25	131	BrP	B	145.3	38.0	61.0	77.0		
26	131	BrP	G	144.8	36.2	60.0	76.0	3.90	3.80
27	132	BrI	G	142.0	32.8	59.0	74.0	4.10	4.13
28	125	BrP	G	144.9	37.6	62.0	77.0	4.10	4.76
29	127	BrC	B						
30	141	BrI	B	150.8	47.0	70.0	82.0	5.30	4.50
31	145	BrI	G					4.30	3.80
32	146	BrP	G						
33	136	BrP	G						
34	142	BrI	G						
35	137	BrP	G						
36	142	BrP	G	141.2	38.2	66.0	79.0	3.30	
37	141	BrI	G	151.8	51.0	74.0	84.0	4.10	5.37
38	142	BrP	G	155.0	45.0	66.0	84.0	3.10	3.80
39	137	BrI	G						
40	135	BrP	G						
41	141	BrP	B	134.5	28.8	54.0	64.0	4.20	3.80
42	135	BrC	B	154.2	50.2	79.0	83.0	4.30	4.89
43	143	BrP	B						
44	144	BrP	B	150.6	41.0	64.0	82.0	4.10	4.19
45	145	BrP	B					4.80	3.80
46	136	BrP	B	152.2	37.4	58.0	74.0	3.80	4.31
47	139	BrP	B	148.2	34.8	57.5	71.0	3.90	3.71

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
48	146	BrC	B						
49	138	BrI	B	154.4	49.4	65.4	85.0	4.60	4.91
50	141	BrP	B	159.5	47.8	66.0	82.0	3.40	5.05
51	141	BrP	G	155.0	46.8	65.0	85.0	3.50	
52	144	BrP	G	155.2	44.2	64.5	84.0	3.40	3.80
53	139	BrP	G	154.8	44.2	78.0	83.0	4.00	4.47
54	141	BrP	B	145.0	30.0	51.0	70.0	4.30	4.78
55	138	BrP	B	150.0	36.2	58.0	74.0		4.34
56	136	BrP	B	147.5	51.4	70.0	93.0	4.70	6.17
57	138	BrP	B	151.8	49.2	69.0	84.0	4.50	4.25
58	146	BrI	G	158.9	41.0	51.5	81.5	4.00	3.80
59	139	BrI	G	151.2	40.2	58.0	79.0	4.50	
60	136	BrP	G						
61	135	BrP	G	143.3	30.6	55.0	70.0	4.60	4.33
62	145	BrP	G	149.8	44.2	66.0	83.0	3.00	3.80
63	137	BrC	G	146.0	62.4	85.0	98.0	4.70	6.10
64	135	BrP	G	137.4	28.0	55.0	69.0	4.70	5.66
65	146	BrP	G	139.5	30.4	56.0	72.0	3.10	4.61
66	139	BrP	G	153.4	35.2	55.0	76.0	4.00	
67	135	BrI	B	162.7	52.0	75.0	87.0	4.20	3.80
68	141	BrI	B	149.0	48.2	78.0	84.0	4.10	3.87
69	145	BrI	G	155.8	41.8	59.0	78.0	4.00	5.36
70	141	BrI	G	147.6	32.0	54.0	72.0	4.60	4.92
71	141	BrC	G	161.8	58.6	72.0	88.0	4.30	4.01
72	146	BrI	G	154.8	43.2	60.0	84.0	4.30	4.02
73	141	BrP	G	146.6	27.2	52.0	64.0		4.13
74	133	BrP	G	150.3	38.8	62.0	80.0	4.60	5.06
75	140	BrI	G	136.7	33.6	58.0	72.0	3.50	5.08
76	144	BrI	G	152.2	38.8	56.0	81.0	4.00	3.80
77	145	BrC	B						
78	135	BrI	B	135.6	33.2	62.0	74.0	4.10	
79	139	BrI	B	149.6	48.2	74.0	87.0	4.20	3.90
80	137	BrP	B						
81	131	BrC	G	143.2	37.8	61.0	78.0		4.02
82	128	BrI	B	135.2	23.4	49.0	62.0	4.70	4.71
83	129	BrI	B	144.0	36.2	58.0	73.0	4.70	4.98
84	131	BrP	B	142.8	29.8	53.0	67.0	4.00	4.44
85	130	BrI	B	151.8	60.6	86.0	92.0		
86	127	BrP	B	146.1	44.6	74.0	82.0	5.10	4.23
87	123	BrP	B	135.8	25.4	54.0	65.0	4.30	4.92
88	136	BrP	B	140.2	31.2	60.0	70.0	3.70	4.72
89	136	BrP	B	129.8	31.4	65.5	73.0	5.10	3.93
90	144	BrC	B	151.3	53.2	71.5	89.0	4.30	4.36
91	146	BrP	B	159.2	44.2	65.5	78.0		
92	139	BrC	G	153.5	58.0	75.0	90.0	5.00	4.06
93	142	BrI	B	149.6	51.4	75.5	87.0	5.10	5.74
94	136	BrI	G	142.4	35.0	59.0	79.0	5.30	3.94
95	146	BrI	G	156.2	37.1	54.5	76.0	3.90	4.42
96	139	BrI	G	144.6	38.0	57.0	79.0		
97	137	BrP	G	149.6	42.2	59.0	84.0		
98	146	BrI	B	140.0	33.0	59.5	73.0	5.10	

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
99	140	BrI	G	159 8	40 0	58.0	79.0	3.30	4 69
100	142	BrI	G	145 5	29.2	51.0	69 0	3.30	4 37
101	135	BrI	G	140.5	33.0	61.0	74 0		
102	142	BrC	G	144 8	47 0	69 0	85.0	3.00	6.09
103	123	BrI	G	141 8	45.0	73.0	84.0	3.50	4 83
104	132	BrP	G	138 8	39.0	70.5	79 0	3.70	4.01
105	127	BrI	G	137 0	30.6	55.0	72.0	3.50	4.08
106	146	BrP	B	144.2	52.4	86.0	91.0	3.70	
107	125	BrI	B	144.5	31.2	54.0	69.0	3.90	4.36
108	133	BrP	B	139.5	31.2	57.0	68.0		
109	126	BrI	B	145.1	50 6	79.0	88.0	4.40	3.92
110	124	BrI	B	137.6	38 8	67.0	79.0	4.10	4.38
111	134	BrI	B	142 8	42.4	70.0	83.0	4.50	3.80
112	143	BrP	G						
113	138	BrP	G	149.5	38.8	60.0	82.0		
114	137	BrP	G	153.5	39.8	58.0	80.0	4.20	3.80
115	141	BrI	G	154.4	49.6	71.0	90.0	3.50	3.80
116	142	BrI	G	147.5	48.6	70.0	84.0	4.50	4.33
117	135	BrI	B	158.0	45 2	67.5	84.0		
118	145	BrI	B	151.7	41.4	65.0	78.0	3.90	5.13
119	139	BrC	B					3.20	3.80
120	138	BrC	B	158.6	48 2	66 0	80.0	3.20	5.12
121	130	BrI	G	151.8	51.6	71.0	88.0	4.70	4.98
122	129	BrP	G	134.5	31.4	54.0	72.0	4.60	4.50
123	129	BrI	G	140.1	40.6	64.0	83.0	4.60	6.40
124	126	BrC	G	138.0	32.8	59 0	73.0	4.00	4.75
125	125	BrI	G	156.8	39 2	58.0	79.0	3.20	3.80
126	132	BrC	B	142.1	40 6	67 0	81.0	4.50	7.80
127	132	BrP	B	142 2	31 6	56.0	71.0	4.30	4.29
128	129	BrC	B	138.2	30.4	60.0	69.0	4.00	
129	139	BrP	G	143.3	31.6	55.0	72.0	3.50	3.92
130	141	BrC	G	147.3	31.0	55 0	72.0	3.00	5.27
131	136	BrC	G	173.2	54 8	65.0	91.0	3.80	4.00
132	137	BrI	G	153.4	36.8	58 0	77.0	3.30	3 80
133	144	BrP	G	158.9	41 4	61 5	81.0	3.00	4 69
134	135	BrP	G	145 0	34 8	57 0	72 0	3.90	7 34
135	142	BrP	G	161 9	59 0	78 0	)5 0	4 30	3.80
136	142	BrP	G	152 6	33 2	53 0	73 0	3 10	3 80
137	146	BrP	G	142 0	28 6	53 0	66 5	3.90	6 82
138	145	BrP	G	162 2	52 2	66 0	89 0		
139	139	BrP	G	144 9	39 0	62 0	80 0	4 00	3 80
140	140	BrC	G	145 5	31 6	58 0	72 0	3 60	5 31
141	140	BrP	B	147 2	34 4	63 0	70 0		
142	145	BrP	B	159 1	37 8	58 5	73 5	4 50	3 80
143	143	BrP	B	149 3	35 8	59 0	73 0	4 50	4 07
144	142	BrC	B	153 2	39 0	61 0	76 0	4 50	3 95
145	142	BrP	B	148 2	30 3	58 0	71 0		3 80
146	136	BrP	B	138 5	33 6	6(0	74 0	5 10	3 80
147	141	BrI	B	151 9	42 8	73 5	82 0		
148	135	BrC	B	135 7	30 2	56 0	69 0	4 70	3 80
149	135	BrI	B						

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
150	146	BrP	B	140.5	33.2	59.0	74 0		
151	139	BrP	G	146 0	34 2	57 0	72 0	3.90	3.80
152	135	BrP	G	154 2	39.2	62.0	76 5	4 50	4 96
153	145	BrP	G	149 4	51 4	69 0	89 0	4 60	4 47
154	145	BrP	G	157 8	57.0	66.0	91 0	4 20	4.19
155	141	BrI	G	144 0	31 0	54.0	69 0	4 10	4 58
156	143	BrP	B	143.8	39.8	68.0	81 0	3.90	5.06
157	141	BrC	B	137.2	34.2	59.0	74 0	3.30	3.80
158	144	BrC	B	148.2	37.8	65.0	78.0		
159	142	BrC	B	146.6	45.6	65.0	82 0	3.20	4.79
160	144	BrP	B	146 8	35.4	57.0	74.0		
161	145	BrI	B	144.2	44.4	67.0	73 0	3.40	
162	141	BrI	B	151.2	35.4	59.5	72 0		
163	143	BrP	B	145.9	32.4	58.5	72.0	5.10	3.80
164	135	BrP	G	151.3	40.2	61.0	79 0	4.50	3.80
165	128	BrP	G	136.8	36.4	68.0	78 0		
166	136	BrP	G	158.2	58.8	70.0	96 0	4.10	
167	146	BrI	G	154.9	68.8	78.0	88.0	4.30	4.92
168	140	BrC	G	159.0	38.8	55.0	76 0	3.10	4 22
169	142	BrI	G	151.6	34.8	55.5	75 5	3.80	3.80
170	146	BrC	G	147.3	65 4	84 5	105	5.00	5.59
171	140	BrP	G	145.2	37.0	62 0	78 0		
172	142	BrI	G	155.0	56.6	71 0	89.0	3.40	4.22
173	142	BrP	G	145 0	30.2	59 0	69.0	4.00	3.80
174	144	BrP	G	140.0	49.6	76 0	88.0	4.20	4.62
175	141	BrI	G	142 8	43.8	65 5	82.0	3.60	4.72
176	144	BrP	G	156.2	57.6	82.0	96.0	4.10	3.80
177	142	BrI	G	148.8	60.6	73.0	97.0		
178	145	BrP	G	153.6	51.4	64.0	91.0	4.70	3.80
179	145	BrP	G	148 8	65.2	82.0	100	3.80	4.20
180	136	BrP	B	146.2	40.8	66.0	79.0	3.80	
181	138	BrP	B	142 6	36.4	64 5	74.0	3.40	4.16
182	141	BrI	B	137.8	31.2	56.0	71.5		
183	146	BrP	B	145 6	41.4	69 0	78.0	3 40	3.80
184	143	BrC	G	168 3	50 4	60 0	84.0	3 80	3.80
185	144	BrI	G	149 2	37 2	62 0	79.0	4 70	3.80
186	139	BrI	G	146 9	34 2	59 5	72.0	4.20	3 80
187	142	BrC	G	138.1	28 6	57.0	69 0	4 80	3.80
188	143	BrC	G	144 3	35.4	58 0	76.0	4.50	
189	142	BrP	G	152.7	39 0	62 0	79 0	3 90	3 80
190	143	BrC	G	162 9	44 4	60 0	81.0	3 20	
191	146	BrP	G	147 8	44 6	63 0	80 0	4 20	5 43
192	144	BrP	G	147 2	53 8	70 0	94 0	4 10	3 80
193	141	BrP	G	134 0	47 0	78 0	84 0	4 00	5 37
194	143	BrP	B	142 1	32 4	57 5	72 0	4 20	4 10
195	145	BrP	B	149 4	28 6	57 0	70 0	3 30	3 80
196	142	BrP	B	149 4	37 6	63 0	75 5	4 00	5 23
197	140	BrP	B	142 9	41 0	70 0	84 5	4 50	
198	137	BrP	B	151 5	37 6	64 0	77 0	3 70	3 80
199	140	BrI	B		40 8			4 30	4 88
200	136	BrP	B						

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
201	137	BrP	B	147 6	36.1	59 5	73.0	4 50	3.80
202	139	BrI	B	145 6	33 6	57 0	69 0	3.70	3.80
203	131	BrP	G	139 8	31.2	59 0	70 0	4 50	5 80
204	131	BrP	G	149 2	32.8	58.0	70 0	4 10	3 80
205	131	BrI	G	130 4	24 8	51.0	68.0		
206	133	BrP	G	152.2	38.2	61.0	78 0	4 00	5.39
207	126	BrP	G	143.6	31.4	54.0	73.0	3.70	5.83
208	126	BrI	G	139.1	29.8	58.0	70.0	4.20	4.66
209	132	BrI	G	146.0	34.0	56.0	73.0	4.00	4.19
210	144	BrP	G	156.5	37.6	57.0	77.0	3 40	4.58
211	134	BrP	G	147.4	48.4	73.0	86.0	4.00	3.88
212	130	BrP	G	148.8	37.8	58.0	78.0	4 20	3.80
213	134	BrI	B	138.0	40.2	69.0	79.0	4 60	4.90
214	128	BrP	B	131.8	31.2	61.0	70.0	4.10	3.80
215	132	BrI	B	148.6	40.2	61.0	79.0	4 40	3.80
216	139	BrP	B	140.1	43.2	69.0	81.0	4 30	5.31
217	134	BrI	B	149.3	39.0	64.0	77.0	5.30	5.36
218	131	BrI	G	145.9	38 6	61.0	82.0	4 60	5.79
219	125	BrP	G	137 0	36.6	64 0	77.0		
220	134	BrI	G	151 6	42.0	61.0	80 0	5 70	4.38
221	123	BrC	G	130.9	26.4	57.0	69 0	3 00	4.41
222	126	BrP	G	127.6	31.2	62.0	72 0		
223	125	BrI	G	152.6	45.2	58.0	85.0		
224	125	BrC	G	128.0	25.2	57.0	64.0	4.10	4.00
225	126	BrC	G	143.6	29.0	52.0	70 0	3.60	4.42
226	129	BrP	B						
227	130	BrP	B	143.1	30.2	61.0	71.0	5.10	4.10
228	127	BrP	B	147.6	52.0	78.0	85.0	3.70	5.98
229	144	BrI	B	139.4	37 4	63.0	76 0	3 80	5.37
230	125	BrP	B	147.9	48.2	80.0	87.0	5.10	5.63
231	[illegible]4	BrP	B	137.8	30.0	57.5	70.0	3.70	3.97
232	123	BrC	B	139.0	35.0	61.0	74 0	4.20	4 81
233	127	BrP	B	141.0	34 0	63.0	74.0	4.10	5.42
234	123	BrI	B	144.4	44 4	74.0	82.0	4.00	4.70
235	130	BrI	B	138 0	28.6	58 0	62.0	3.50	3.96
236	132	BrP	G	151.2	45 4	71.0	83 0	4 20	4 34
237	124	BrI	G	139.3	26 0	52.0	66.0		
238	133	BrP	G	135 3	27.0	53.5	71 0		
239	130	BrP	G	150 0	51 4	66 5	89 0	4 00	4 12
240	127	BrP	G	155 2	60 0	87 0	95 0	3 60	6 97
241	128	BrI	G	132.1	24 6	50 0	67 0	3 60	3 92
242	125	BrI	B	138 9	32 4	60 0	76 0		
243	127	BrP	B	136 0	35 2	66 0	76 0	4 50	4 65
244	133	BrP	B	146 5	31 6	58 0	71 0		
245	132	BrP	B	130 2	26 4	57 0	65 0	3 30	3 80
246	126	BrI	B	136 0	26 8	52 0	60 0		
247	129	BrC	B	149 8	34 0	58 0	74 0	3 70	4 06
248	131	BrI	G	159 3	40 0	59 0	80 0	2 80	3 80
249	134	BrP	G	150 4	40 6	66 0	83 0	3 60	4 20
250	133	BrP	G	157 1	46 6	66 [illegible]	84 5	4 20	3 94
251	126	BrP	G						

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
252	127	BrP	B	140 2	36.6	63.0	77.0	4.20	4 68
253	128	BrC	B	151 6	49 8	76 0	89 0	3.50	3 80
254	129	BrP	B	143.2	35.2	62.0	73 0	3.80	4 41
255	133	BrI	B	145.0	32 6	57.0	72.0		
256	133	BrP	B						
257		RrP	G	148.0	47.0	71.0	82.0	4.10	3 80
258		RrP	G	152.0	42.0	64.0	79.5		
259	132	RrP	G	130.6	26.0				
260		RrP	G	141.9	37.0	59.0	71.0		
261		RrP	G	134 5	26.0	54.0	65.0		
262		RrP	G	127.2	23.0				
263	154	RrP	G	154.5	38.0	58.0	77.0	2.60	
264	156	RrP	G	142.2	38.0	59 1	81.0	3.80	4.99
265	156	RrP	G	147.0	40.0	60.0	79.0	3.20	4.02
266	154	RrP	G	143.5	34.0	55.0	75.0	3.80	4.58
267	144	RrP	G	147.0	32.0	52.0	72.0	3.80	4.16
268		RrP	G					4.00	4.45
269	132	RrP	G	139.5	34.0	60.0	77.0	3.80	3.80
270	151	RrP	G	133.0	42.0	60.5	83.0	3.50	3.80
271	139	RrP	G	135.0	25.0	51.0	70.0	3.70	4.34
272		RrP	G	138.2	58.0				
273	144	RrP	G	156.6	40.0	57.0	80.0	3.60	3.80
274		RrP	G					3.00	3.80
275	154	RrP	G	140.4	25.0	51.0	66.0	4.20	3.80
276	153	RrP	G	136.0	36.0	55.0	77.5		
277	144	RrP	G	152.6	39.0	61.0	82 0	3.90	3.80
278		RrP	G	151.5	42.0	60.0	82.5	3.60	4.36
279	120	RrP	G	152.4	32.0	57.5	71.5	3.40	3.80
280	129	RrP	G	157.0	38.0	58 0	80.0	3.50	3.80
281	141	RrP	G	152.8	37.0	57.5	81.0	3.60	4.37
282	120	RrP	G						
283	153	RrP	G	156.0	40.0	62.0	83.0	3 80	3.80
284	132	RrP	G	142.5	32 0	56 0	76.0	3 70	4 10
285		RrP	G	155.0	35.0	55 0	77 0	3.20	3.80
286	162	RrP	G	149 0	39 0	57 0	83 0	4 30	4.20
287	109	RrP	G						
288	168	RrP	G	150.0	46 0	65 0	87.0		3 80
289		RrP	G	131.3	27 0			4 00	3 80
290	132	RrP	G	133.0	28 0			3 60	4 09
291		RrP	G	135 5	25 0	51 5	67.0	3 60	3 80
292		RrP	G	138 5	29 0	55 0	67 0	4 20	4 53
293	141	RrP	G	156 6	45 0	59 0	85 0	3 60	4 11
294	158	RrP	G	151 5	35 0	60 0	77 0	3 20	
295		RrP	G	132 0	35 0	60 5	77 0		
296	117	RrP	G	130 0	24 0	49 0	65 0	4 30	3 80
297		RrP	G	136 0	37 0	64 5	79 5	3 80	4 37
298	137	RrP	G	132 0	38 0	59 0	78 0		
299		RrP	G	145 0	35 0	60 0	75 0	4 10	3 80
300	129	RrP	G	144 5	30 0	54 0	71 0	3 60	3 80
301	120	RrP	G	124 0	21 0	50 5	61 0	3.70	5 35
302	141	RrP	G	122 2	20 0	53 0	65 0	4 00	3 92

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
303	135	RrP	G	133.0	24.0	49.5	65.5	3.20	3.80
304		RrP	G	153.2	43.0	60.5	81.0	4.30	4.42
305	91	RrP	G	125.2	20.0	44.0	60.0	3.00	3.80
306		RrP	G	146.1	40.0	61.5	81.5	4.90	3.80
307	120	RrP	G	127.3	24.0	50.5	67.0	3.40	4.53
308	168	RrP	G	140.5	30.0	54.0	72.0	3.20	3.80
309	123	RrP	G	129.1	23.0	49.5	65.5	3.50	3.80
310		RrP	G	134.4	25.0	50.4	68.5	3.50	3.80
311	132	RrP	G	135.0	22.0	46.0	61.5	3.20	3.80
312		RrP	G	128.4	22.0	49.0	63.0	3.20	3.80
313		RrP	G	140.3	25.0	46.0	65.0	3.70	3.80
314		RrP	G	128.2	29.0	55.0	71.0	3.00	3.80
315	139	RrP	G	130.2	29.0	57.0	68.0	3.70	3.80
316		RrP	B	135.0	29.0	60.0	75.0		
317		RrP	B	137.5	29.0	59.0	74.0		
318		RrP	B	146.4	30.0				
319		RrP	B	150.5	34.0	56.0	62.0		
320		RrP	B	157.2	37.0	56.0	69.0		
321	132	RrP	B	122.3	32.0	53.0	69.0		
322		RrP	B	136.5	25.0				
323		RrP	B	135.0	32.0				
324		RrP	B	124.5	23.0	62.0	84.0		
325	145	RrP	B						
326		RrP	B	128.0	28.0	56.0	69.0	4.10	4.29
327		RrP	B	145.3	34.0				
328		RrP	B					4.00	6.15
329	145	RrP	B					4.00	
330		RrP	B	131.0	35.0	53.0	62.0		
331	153	RrP	B	142.0	38.0			4.30	3.80
332		RrP	B	124.0	21.0	55.0	59.0		
333		RrP	B						
334	132	RrP	B	133.0	25.0	56.0	66.0	4.50	
335		RrP	B						
336		RrP	B	155.0	44.0	63.0	85.0	4.00	3.80
337	152	RrP	B	139.2	29.0	54.0	70.0		
338		RrP	B	134.0	25.0	56.0	66.0	3.80	3.80
339	117	RrP	B						
340	129	RrP	B	137.5	27.0	53.0	66.0	3.50	3.80
341		RrP	B	135.6	29.0	55.0	68.5		
342		RrP	B	155.0	57.0	75.0	92.0		
343	152	RrP	B						
344	144	RrP	B	147.3	34.0			3.50	3.80
345	129	RrP	B	134.4	26.0	54.0	67.5	4.90	4.60
346	155	RrP	B	130.5	26.0	55.1	75.0		
347	113	RrP	B	144.2	29.0			3.10	3.96
348		RrP	B					5.60	4.34
349	136	RrP	B	132.6	[illegible]	59.0	70.5	3.50	3.80
350	129	RrP	B	137.5	33.0	59.5	74.5	5.60	4.16
351	163	RrP	B	144.2	37.0				
352	108	RrP	B	124.0	24.0				
353		RrP	B					3.30	4.47

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
354	117	RrP	B	133.5	24 0	50.0	60.0	4 10	3.97
355	112	RrP	B						
356		RrP	B	141.6	30 0	59.0	63.5	3.00	3.80
357		RrP	B						
358		RrP	B	142.5	34 0	61.0	75 0	4 00	4 53
359	153	RrP	B	157.0	30.0	62.0	81.0	4 20	3.80
360	138	RrP	B	136.8	30.0	54.0	68.0		5.05
361	154	RrP	B	145.7	33.0	55.0	71.0	4 60	3.80
362		RrP	B	136.5	26.0	53.0	62.0		3 80
363		RrP	B	131.8	24.0	51.0	63.0	4.60	3.80
364	120	RrP	B	123.6	20.0	53.0	60.0		3.80
365	143	RrP	B	143.1	32.0	54.0	70.0	5.60	3.80
366		RrP	B	135.6	26.0	52.0	65.0		3.80
367	123	RrP	B	134.7	26.0	51.0	59.0	3.50	4.65
368		RrP	B	137.0	30.0	55.0	70.0	3.20	4.98
369	120	RrP	B	140.3	26.0	49.0	68.0	2.90	3.80
370		RrP	B	137.4	28.0	52.0	68.0		3.80
371		RrP	B	130.3	25.0	54 0	66.0	2.90	3.80
372	131	RrP	B	133.4	26.0	52 0	69.0	3.30	4.06
373	129	RrP	B	124.3	20 0	52.0	61.0		3.80
374		RrP	B	134.0	27.0	56 0	66.0		3.80
375	117	RrP	B	131.0	30 0	57.0	69.0	3.40	3.80
376		RrP	B	156.6	36.0	57.5	75.0	3.10	3.80
377	133	RrP	B	135.0	26.0	53.0	64.0		3.80
378		RrP	B	131.4	23.0	57.0	63.0		3.80
379		RrP	B	132.8	24.0	54.0	62.0	3.30	4.37
380		RrP	B	142.6	35.0	57.0	72.0	3.10	4.15
381	120	RrP	B	134.1	24.0	53 0	62.0		3.80
382		RrP	B	134.8	29.0	52.0	66.0	4.50	3.80
383	120	RrP	B	133.3	25.0	55.0	66.0		3 80
384	128	RrP	B	136.4	27.0	53.0	65.0		3.80
385	147	RrP	B	134.0	24 0	55.0	67.0	2.80	4.05
386		RrP	B	126.2	23.0	54.0	66.0		3.80
387		RrP	B	125.6	22.0	56 0	61.0	3.50	3.88
388		RrP	B	124.0	21.0	53 0	66.0		3.80
389	126	RrP	B	133.4	26.0	50 0	63.0		4 16
390		RrP	B	140.0	33.0	57 0	70.0		3 80
391	141	RrP	B	139.4	25.0	48 0	62.0	3 80	3.80
392		RrP	B	134.9	27.0	60.0	69.0	3.00	4 11
393		RrP	B	137 4	26.0	52.0	63.0	3.20	3 80
394		RrP	B	160 3	40 0	60 0	77 0	3.00	4 09
395		RrP	B	129 4	25 0	57 0	64.0	3.60	3 80
396	132	LaP	G						
397	113	LaP	G						
398		LaP	G	137 3	32 0	56 5	74 5		
399	135	LaP	G	153 0	44 0	61 0	87 0	4 20	3 80
400	132	LaP	G	136 2	30 0	53 0	72 0	4 60	5 14
401	108	LaP	G	137 0	23 0	49 5	64 5		
402		LaP	G	153 0	40 0	61 0	80 0	4 10	4 00
403	134	LaP	G	156 2	46 0	71 0	83 0	3 90	5 07
404	117	LaP	G	135 5	28 0	55 0	70 0		

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
405		LaP	G	141.2	48.0	74.0	90.0	4.00	4.26
406	149	LaP	G	158.0	42.0	63 0	88.0	4.20	3.80
407		LaP	G					4.00	4.07
408		LaP	G	132.0	28 0	58.0	70.0		
409		LaP	G	142.0	36 0	61.0	77.0		
410		LaP	G	144 2	28.0	52.0	69.0		
411	132	LaP	G	144.3	28.0	53.5	69.0		
412		LaP	G	148.1	31.0	52.5	74.5	4.00	3.80
413		LaP	G	146.8	44.0	61.0	85.0	4.10	3.80
414		LaP	G	155.0	53.0	68.0	94.0	4.60	3.80
415	132	LaP	G	148.2	33.0	55.0	75.0	4.70	3.80
416	132	LaP	G	154.0	45.0	63.0	81.0	4.10	3.80
417		LaP	G	135.0	28.0	55.5	68.0	4.70	3.80
418	108	LaP	G	142.0	32.0	56.0	71.0	3.90	4.73
419	133	LaP	G	148.2	45.0	70.5	88.0	4.30	3.80
420		LaP	G	140.0	27.0	52.0	71.0	4.30	3.80
421	120	LaP	G	140.5	25.0	52.0	66.0		
422	132	LaP	G	138.6	29 0	51.5	69.0	3.80	4.16
423		LaP	G	142.8	37.0	60.0	78.0	3.90	5.93
424	139	LaP	B	139.5	29.0	57.0	65.5		
425	128	LaP	B	146.0	52.0	74.5	88.0	4.30	3.80
426		LaP	B	149.0	40.0	61.5	78.0	4.50	3.80
427		LaP	B	139.2	28.0	54.0	67.5	3.90	3.80
428		LaP	B	138.0	26.0	52.0	66.5		
429		LaP	B						
430	132	LaP	B	162.3	40.0	55.0	74.0	3.70	3.80
431		LaP	B	137.8	32.0	59.5	73.0		
432		LaP	B	165.0	59.0	75.0	91.0		
433		LaP	B	155.2	36.0	56.0	72.0	4.10	4.58
434		LaP	B	136.4	35.0	64.5	79.0		
435	153	LaP	B	145.8	35.0	58.0	74.0		
436	141	LaP	B	155.5	43.0	69.5	75.5	4.20	3.80
437	123	LaP	B	135.6	22.0	48.0	62.0	3.80	3.94
438	145	LaP	B	142.2	32.0	57.0	74.0	4.40	3.80
439		LaP	B	165.0	56 0	67.0	87.0	4.80	3.80
440	128	LaP	B	143.2	29.0	55.0	69.0		
441	129	LaP	B	138.0	27.0	55.0	66.0	3.70	3.80
442	137	LaP	B	146 2	37 0	58 0	73.0	4 00	3 80
443		LaP	B	142 0	37 0	62.0	78.0	5.80	4 64
444		LaP	B	142.0	29 0	57.0	69.0		
445		LaP	B						
446	144	LaP	B	155 0	39 0	58.0	76.5	3.80	4 65
447		LaP	B	139 5	40 0	62.0	77 0		
448	132	LaP	G	140 0	30 0	54 0	71.0	4.20	5 14
449	137	LaP	G	145 8	34 0	52 0	76 0	4 50	3 80
450	139	LaP	G	149 5	42 0	60 0	81 0	3 30	3 94
451	144	LaP	G	154 0	36 0	57 0	79 0	5 40	3 80
452	149	LaP	G	147 5	32 0	53 5	71 0	4 30	3 80
453	135	LaP	G	146 0	34 0	58 0	72 0	5 00	3 80
454		LaP	G	157 0	42 0	59 0	82 0		
455	143	LaP	G	145 0	52 0	70 0	90 0	4 10	3 80

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
456		LaP	G	153 0	36.0	54 0	79.0		
457	132	LaP	G	131.0	30.0	52.0	70 0		
458	144	LaP	G	148 5	41.0	62.0	81.5	5.60	3.80
459	144	LaP	G	147 0	35.0	52.0	78.0		
460	152	LaP	G	153 0	60.0	77.0	102	4 90	3.80
461	147	LaP	G	137.0	27.0	51.0	69.0	4.40	3.80
462	144	LaP	G	151.7	40.0	58.0	82.0	6.80	3.80
463	132	LaP	G	145.2	27.0	48.0	55.0	5.00	3.80
464	144	LaP	G	144.7	26.0	54.0	67.0	4.00	4.44
465	146	LaP	G	153.0	37.0	57.0	67.0		
466	144	LaP	G	156 0	36.0	56.0	75.0	4.60	3.80
467	154	LaP	G	148.0	41.0	59.0	86.0	5.30	5.07
468	120	LaP	G	146.0	30.0	50.0	67.0	3.70	3.80
469	138	LaP	G	141.0	34.0	57.0	73.0		
470	155	LaP	G	153.1	38.0	59.0	71.0	4.30	4.46
471	129	LaP	G	138.4	29.0	53.0	63.0	3.80	3.80
472	113	LaP	G	141.2	31.0	52.5	67.0	4.40	3.80
473	144	LaP	G	160.5	37.0	55.0	73.5	4.00	3.80
474	150	LaP	G	143.0	42.0	66.0	88.0	3.90	3.80
475	153	LaP	G	140.2	29.0	54.0	67.0	5.60	3.80
476	155	LaP	G	146.0	35.0	54.0	83.0	4.10	3.80
477	153	LaP	G	153.0	36.0	55.0	75.0	4.70	3.80
478	154	LaP	G	147.5	44.0	62.0	82.0	4.40	3.96
479	145	LaP	G	147.0	28.0	50.0	68.0		
480	144	LaP	G	144.3	28.0	52.0	70.0		
481	141	LaP	G	163.0	36.0	61.0	87.0	4.00	3.80
482	138	LaP	G	148.2	44.0	59.0	84.0	4.20	3.80
483	137	LaP	G	156.0	45.0	61.0	86.0	4.10	5.23
484	154	LaP	G	156.2	41.0	50.0	82.0	4.30	3.80
485	144	LaP	G	141.8	44.0	66.0	84.0	4.20	4.58
486	156	LaP	G	146.0	36.0	55.5	76.0	4.20	3.80
487		LaP	B						
488	119	LaP	B	143.2	39.0	61.0	70.0	3.60	5.67
489	141	LaP	B						
490		LaP	B						
491	129	LaP	B						
492	129	LaP	B	126.2	20.0	48.0	67.0	3.70	3.92
493	116	LaP	B	134 6	30 0	60.0	72.0	4 50	
494	140	LaP	B	135.1	28.0	61 0	66.0	3.90	3.80
495		LaP	B						
496	133	LaP	B	141.7	49 0	75 0	89 0	4 00	4 03
497	129	LaP	B	139 0	30 0	57 0	66 0	4 90	3 90
498		LaP	B						
499	113	LaP	B	135 8	29 0	60 0	69 0	4 20	3 80
500	132	LaP	B	140 7	25 0	58 0	63 0	4 30	4 40
501		LaP	B						
502	129	LaP	B	140 3	40 0	76 0	80 0	4 00	4 28
503	129	LaP	B	136 8	24 0	54 0	63 0	4 30	4 08
504	116	LaP	B	137 0	30 0	60 0	73 0	3 70	3 80
505		LaP	B						
506		LaP	B						

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
507		LaP	B	140.9	31.0		72.0		
508	127	LaP	B	141.3	28.0	54.0	70.0	3.70	4.70
509	129	LaP	B	149.0	41.0				
510		LaP	B	141.7	29.0	61 0	65 0	3.50	3.80
511	134	LaP	B	135.1	28.0	61.0	66.0	3.90	3.80
512	135	LaP	B	126.2	25.0	53.0	62.0	4.90	4.11
513		LaP	B						
514		LaP	B						
515		LaP	B						
516	121	LaP	B						
517		LaP	B	147.0	30.0	54.0	67.0		
518	128	LaP	B	135.0	25.0	50.0	65.0	3.90	3.80
519		LaP	B	137.2	30.0	59.0	69.0	4.80	4.28
520		LaP	B						
521		LaP	B						
522	129	LaP	B						
523	123	LaP	B	143.4	33.0	60.0	70.0	3.50	4.79
524		LaP	B	137.0	28.0	53.0	66.0	3.10	3.80
525		LaP	B	136.0	33.0	59.0	75.0		
526		LaP	B						
527		LaP	B	140.2	32.0	54.0	71.0	3.50	3.80
528		LaP	B	142.6	32.0	60.0	73.0		
529		LaP	B	135.0	26.0	52.0	64.0		
530	126	LaP	B						
531		LaP	B	148.5	62.0	78.0	89 0	4.50	5.71
532	123	LaP	B	132.6	35 0	65.0	78 0	3.70	4.41
533	122	LaP	B						
534		LaP	B	133.0	22.0	49.0	63.0		
535	129	LaP	B	142.2	30.0	53.0	68.0	4.50	3.80
536	129	LaP	B	139.2	37.0	62.0	78.0	3.60	4.68
537	128	LaP	B						
538	131	LaP	B	139.0	36.0	63.0	80.0	4.30	3.79
539		LaP	B	135.0	24.0			3.70	4.29
540	119	LaP	B						
541		LaP	B	143.6	33 0	58.0	70 0		
542		LaP	B	146.9	40 0	67 0	78 0	4 00	6 14
543		LaP	B	135.2	27 0	49 0	60 0		
544		LaP	B						
545		LaP	B						
546	155	LaP	B	147 3	35 0	53 0	72 0	3 60	4 41
547		LaP	B						
548		LaP	B	136 1	29 0	55 0	68 0	3 70	3 80
549	145	LaP	B						
550		LaP	B	157 0	57 0	76 0	90 0	3 70	3 80
551	163	LaP	B						
552	135	LaP	B	130 2	25 0	57 0	66 0	4 00	4 01
553		LaP	B	152 6	30 0	59 0	67 0	3 60	4 26
554	143	LaP	B	142 6	32 0	55 0	67 0	5.90	3 80
555		LaP	B	129 4	25 0	54 0	67 0	3 50	3 80
556		LaP	B						
557		LaP	B	136 7	35 0	64 5	76 0	4 40	4 06

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
558		LaP	B						
559	126	LaP	B						
560		LaP	B	136 3	30.0	59 0	66.0	4.00	4.84
561	128	LaP	B						
562		LaP	B						
563		LaP	B						
564	138	AfP	G	128.7	20.0	50 0	61.0	3.20	3.80
565	120	AfP	G						
566		AfP	G	158 6	56.0	72.5	96.0	3.50	3.80
567	117	AfP	G	162.6	55.0	64.0	95.0	4.00	3.80
568	131	AfP	G	151.0	43.0	61.0	86.0	3.70	3.80
569		AfP	G	147.0	46.0	71.0	89.0		
570	132	AfP	G	144 0	46.0	69.0	86.0		
571	122	AfP	G	133.2	39.0	67.0	82.0		
572		AfP	G	140.4	30.0	54.0	74.0		
573	154	AfP	G	153.2	37.0	55.0	78.0	4.00	3.80
574	135	AfP	G	146.0	39.0	59.0	84.0		
575	134	AfP	G	150.0	25.0	50.0	67.0	3.70	5.29
576		AfP	G						
577	126	AfP	G	142.7	26.0	52.5	67.0		
578		AfP	G						
579	143	AfP	G						
580		AfP	G	157.7	59.0	76.5	90.0	4 00	3.80
581	137	AfP	G	142.0	33.0	57.0	75.0	4.20	3.80
582		AfP	G	152.0	32.0	58.0	72.0	3 60	3.97
583		AfP	G	150.0	44.0	66.0	79.5	4.00	3.80
584		AfP	G						
585	126	AfP	G	144.0	39.0	65 0	85.0		
586	120	AfP	G	153.5	65.0	80 0	97.5		
587	140	AfP	G	143.3	45.0	73.5	91.0	3.30	3.80
588	133	AfP	G	140.6	36.0	72.0	83.0	3.60	3.80
589	128	AfP	G	151.0	46.0	65.5	86.0		
590	138	AfP	G	138.3	30.0	58 0	73.0		
591		AfP	G	163.0	58 0	77 0	96 0	3.80	3.80
592		AfP	G						
593	139	AfP	G	150 9	53.0	71.5	90 0	3 80	3.80
594		AfP	G	141 8	25 0	52 0	67 0		
595	132	AfP	G	146 6	33 0	56 5	77 0		
596	135	AfP	G	144 2	28 0	54 0	71.0	4 20	4 02
597	133	AfP	G	142 3	30 0	52.0	70 0	2 90	3 80
598	139	AfP	G	139 2	27 0	55 0	70 0	3.60	3 80
599		AfP	G						
600	123	AfP	G	138 9	26 0	53 0	68 0	3.50	3 80
601	126	AfP	G	151 9	30 0	52 0	72 0		
602	129	AfP	G	148 8	30 0	54 5	70 0	3 40	3 80
603	144	AfP	G	150 2	40 0	59 0	82 0		
604	135	AfP	G	159 0	56 0	70 0	96 0		
605	140	AfP	G	144 0	26 0	52 0	69 0		
606	133	AfP	G	142 4	35 0	73 0	96 0	3 80	3 80
607	153	AfP	G	157 6	53 0	67 0	91 0	3 50	3 96
608	140	AfP	G	147 4	47 0	67 5	89 0		

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
609	150	AfP	G	145.5	54 0	61.0	73.0	4.30	3.80
610	139	AfP	G	140.9	45.0	70.0	87.0		
611	139	AfP	G	145 9	33.0	53.0	74.0	3.80	4 43
612	144	AfP	G	150 0	45 0	65.0	87.5		
613	144	AfP	G	133 2	28.0	50.0	71.0	3.60	5.31
614	146	AfP	G	155.2	50.5	66.5	95.0	3.50	3 80
615		AfP	G	159.1	40.0	57.0	80.0		
616	132	AfP	G	143.8	30.0	55.5	71.5	3.60	3.80
617	140	AfP	G	156.2	34.0	54.4	81.0		
618	135	AfP	G	143.7	34.0	53.0	76.5		
619	140	AfP	G	147.6	29.0	54.0	68.5	3 40	3 80
620		AfP	G	152.1	52.0	77.0	90.0	3.70	3.80
621	144	AfP	G	166.2	60.0	74.0	93.5		
622	120	AfP	G	141.0	27.0	52.0	67.0		
623	144	AfP	G	156.0	47.0	65.0	84.0	4.30	3.80
624	132	AfP	G	147.6	40.0	62.0	82.0	3.70	3 80
625	144	AfP	G	160.2	48.0	63.0	85.0	3.70	3 80
626		AfP	G	151.8	42.0	63.0	83.0		
627	141	AfP	G	140.4	28.0	53.0	70.0		
628	132	AfP	G	147.3	35.0		79.0	3.50	4.74
629	144	AfP	G	145.2	38.0	61.0	79.0	3.60	4.90
630	139	AfP	G	143.3	29.0	52.0	70.0	3.30	4.51
631	152	AfP	G	153.7	40.0	58.0	81.0	3.80	3.80
632	144	AfP	G	161.2	47.0	62.0	91.0		
633	141	AfP	G	155.6	45.0	62.0	87.0	3.60	3.80
634	139	AfP	G	145.5	61.0	73.0	73.0	4.30	3.80
635	144	AfP	G	154.0	41.0	57.0	85.0	3.60	3.80
636		AfP	G	148.0	40.0	60.0	84.0		
637	141	AfP	G	147.0	36.0	55.0	79.0	3.80	3.80
638		AfP	G						
639	149	AfP	G	157.0	40.5	58.0	83.0	3.10	3.80
640		AfP	G	152.5	45.0	62.0	89.0	3.60	3.80
641	154	AfP	G	151.8	40.0	62.5	83.5		
642		AfP	G	154.2	68.0	84.0	104		
643	140	AfP	G	149 3	37 0	58 5	78 0	3.90	3 80
644	129	AfP	G	149.0	45 0	69 0	85.0		
645	138	AfP	G	143 5	31 0	56 5	76 0	3 80	3.80
646		AfP	G	145 2	38 0	61 0	79 0	3 60	4 90
647	136	AfP	G	146 0	49 0	70 0	94 0	3 80	4 90
648		AfP	B						
649		AfP	B	134 5	34 0	59 0	74.2	4 00	3 94
650	120	AfP	B						
651	128	AfP	B						
652	113	AfP	B						
653	147	AfP	B						
654	123	AfP	B						
655	128	AfP	B						
656	132	AfP	B	141 3	25 0	53 0	66 0	4 30	3 80
657	127	AfP	B	144 4	32 0	55 5	71 8	3 00	3 80
658	163	AfP	B						
659	131	AfP	B	144 1	28 0	56 1	67 9		

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
660	128	AfP	B	140.1	31.0	54 4	68.9	3.60	3.80
661	132	AfP	B						
662		AfP	B						
663	132	AfP	B						
664		AfP	B						
665	133	AfP	B	144 6	31.0	54 0	67.9	3.90	3.80
666		AfP	B						
667		AfP	B						
668	141	AfP	B						
669	128	AfP	B						
670		AfP	B						
671	157	AfP	B	140.1	30.0	57.5	68.9	4.70	3.80
672	141	AfP	B						
673	129	AfP	B	150.5	36.0	60.0	73.2	4.40	3.80
674	163	AfP	B	159.0	41.0	65.0	78 6		
675	137	AfP	B						
676	133	AfP	B						
677		AfP	B						
678	136	AfP	B	142.4	30.0	54.0	71.8		
679	127	AfP	B	141.2	32.0	57.6	71.8	4.50	3.80
680	148	AfP	B	153.0	40.0	65.0	80.5	4.80	3.80
681	133	AfP	B						
682	127	AfP	B	138.5	35.0	62.5	77.6	4.50	5.20
683		AfP	B						
684	128	AfP	B						
685	137	AfP	B						
686	135	AfP	B	145.2	33.0	56.5	71.8	4.10	3.80
687	126	AfP	B						
688	128	AfP	B						
689	129	AfP	B	148.9	32 0	53.5	69 8	4.20	5.04
690	136	AfP	B						
691	128	AfP	B	147.3	35.0	59 0	75.2	4 30	3.80
692		AfP	B	141.0	26.0	56.0	66.4		
693		AfP	B	146.6	32.0	55.5	70.8	3.60	3.80
694	126	AfP	B	142.9	28 0	52 0	67.4	4 50	4 63
695		AfP	B						
696	140	AfP	B						
697		AfP	B						
698	123	AfP	B						
699	128	AfP	B						
700	116	AfP	B						
701		AfP	B						
702	149	AfP	B						
703	163	AfP	B	156 0	40 0	63 0	81 0	4 20	4 84
704	127	AfP	B						
705	137	AfP	B	145 8	34 0	52 5	73 2		
706		AfP	B						
707	136	AfP	B						
708	150	AfP	B	156 5	36 0	59 0	74 2	3 50	3 80
709	140	AfP	B	137 0	32 0	56 5	73 2	4 30	4 88
710	144	AfP	B						

	Age in months	Group	Sex	Height (cm)	Weight (kg)	Waist circ. (cm)	Hip circ. (cm)	FBG mmol/l	TBC mmol/l
711	157	AfP	B						
712	135	AfP	B	149 0	40.0	63.0	81.0	4.50	4.63
713	156	AfP	B	157.0	69.0	89.0	97.5	4.40	3.80
714	137	AfP	B	140.0	36.0	66.0	77.1	4.30	3.80
715	162	AfP	B	163.5	43.0	57.5	77.1	3.60	3.80
716	137	AfP	B						
717	140	AfP	B						
718	144	AfP	B						
719	146	AfP	B						
720	155	AfP	B						
721	144	AfP	B						
722	144	AfP	B						
723	137	AfP	B						
724	146	AfP	B	141.5	30.0	53.5	69.4	4.75	5.13
725	147	AfP	B	164.0	45.0	59.5	81.0	4.30	3.80
726	144	AfP	B						
727	140	AfP	B	147.2	35.0	57.5	72.3	5.10	4.25
728	145	AfP	B	145.0	30.0	55.5	70.8	4.40	3.80
729	148	AfP	B	155.3	34.0	54.0	72.3	4.20	4.21
730	154	AfP	B						
731	140	AfP	B	139.0	33.0	60.5	69.4	3.50	3.80
732	147	AfP	B	149 6	35.0	58.6	76 1	3.50	3.80
733	147	AfP	B	142.0	30.0	52.2	67.9	3.80	3.80
734	155	AfP	B						
735	135	AfP	B	144.7	56.0	83.5	95.5		
736	137	AfP	B						
737	140	AfP	B						
738		AfP	B						
739	145	AfP	B	148.0	29.0	58.5	69.4		4.02
740	132	AfP	B	153.5	65.0	89.5	96.5	5.00	4.05
741	136	AfP	B	156.5	55.0	75.0	89.2		
742	146	AfP	B						
743	156	AfP	B						
744		AfP	B						
745									

Appendix 10

Glossary Of Urdu Words Used

1	Asli	pure
2.	Balai	Milk
3.	Banaspati	literally meaning Artificial, term *banaspati ghee* is used for hydrogenated vegetable oils
4.	Barfi	A fudge-like milk based Asian sweet
5.	Bhaji	a vegetable preparationserved with rice or chapati
6.	Biryani	a rich preparation of rice. Partially boiled rice is put in layers with a rich meat curry and the whole is baked till cooked.
7.	Chapati (roti)	Asian wheat bread made with unfermented dough, round in shape and about one eighth inch thick.
8.	Chevda	A mixture of nuts, fried pressed rice, fried lentils, gram preparation and spices.
9	Dal	Lentil, a large variety of lentils is eaten in Indian and Pakistan
10.	Desi	literally meaning Oriental, term desi ghee used for pure fat obtained from milk
11.	Ghee	Clarified butter or vegetable shortening processed to resemble clarified butter.
12.	Gur	Jaggery (molasses)
13.	Halal	Foods allowed to be eaten by followers of Islam
14.	Haram	Foods not allowed to be eaten by religion Islam
15.	Kachnar	small bud from pomegranate tree
16.	Karela	Bitter gourd
17.	Kulcha	Small nan made with white flour and garnished with sesame seeds .
18.	Loki	Calabash cucumber or bottle gourd
19.	Mithai	Asian sweets
20.	Nan	Indian bread made of slightly leavened dough baked on the wall of a mud oven
21	Pakora	a made up rissole of lentil or vegetable served as a snack
22	Paratha	fried Asian bread made of unleavened wheat flour
23	Pulao	rice preparation, rice is fried in fat and cooked in stock and water (mostly contains meat and /or vegetables also)
24	Puri	deep fried Asian bread, round, made with unleavened dough; typically with white flour and slightly smaller than chapati in size (6-8")
25	Saag	Green leafy vegetables
26	Samosa	a thin layer of wheat flour dough filled with boiled vegetable or mince meat and deep fried.
27	Sevian	Vermicilli cooked with milk and sugar
28	Tinda	Small round bottle gourd like vegetable
29	Turai	ridge gourd

Appendix 11

Food Groups

1 Breakfast Cereal, Plain. *corn flakes, rice crispies,etc*
2. Breakfast Cereal, Sugared : *frosties, coco pops etc*
3 Breakfast Cereal, High Fibre: *weetabix, bran flakes etc*
4. Milk Whole (With Cereals)
5. Milk Skimmed (With Cereals): *includes skimmed and semi-skimmed milk*
6. Bread Asian, White : *inclues all white asian breads, naan, pitta bread*
7. Bread Asian, Wholemeal : *includes chapati, wholemal pitta /bread*
8. Bread Asian, Fried: *includes, puri, paratha, fried pitta bread*
9. Bread English, White : *includes all types of white english sliced breads, baps, rolls etc*
10. Bread English, Wholemeal: *includes all types of english wholemeal or added fibre breads,rolls etc*
11. Bread English, Fried: *includes all english fried breads*
12. Rice, Plain (Boiled) : *plain boiled rice eaten as accompaniment to other foods*
13. Rice, Fried : *plain fried rice*
14. Pasta, Plain : *plain pasta eaten as accompaniment to other foods*
15. Cheese : *cheese eaten as accompanimen to other food*
16. Yogurt, Plain : *plain yoghurt eaten as accompaniment to other foods*
17. Gravy : *gravy, dumplings etc*
18. Potato Chips, Fried : *ordinary fried chips (french fries)*
19. Raw Or Boiled Vegetables: *eaten as salads or accompaniments to other foods*
20. Other Potato (Jacket,Mashed Etc) : *include, jacket, mashed, roasted potatoes*
21. Crisps : *ordinary potato crisps*
22. Pop Corns Etc. : *includes popocorns, corn chips etc*
23. Asian Snacks (Chat, Chevda) : *includes chat, chevda etc*
24 Asian Snacks, (Pakora, Samosa) . *includes pakora and samosas*
25 Vegetable Patties:
26 Sweets (Candies) : *candies, boiled sweets, fruit pastilles etc*
27. Chocolates: *all plain or mik chocolates*
28 Biscuits *all kinds of biscuits*
29. Cakes: *all cakes*
30 Fruits : *all fresh fruits*
31 Fruit Yoghurt *all fruit flavored or fruit mixed yoghurts*
32. Nuts *all plain or roasted nuts like peanuts, pine nuts etc*
33 Tinned Fruits *all tinned fruits*
34 Tea or Coffee *includes tea and coffee*
35 Fruit Juice *includes all fresh or cartoned pure juice*

36 Fruit Drink : *includes all fruit flavored or fruit juice containing drinks*
37. Fizzy Drink : *includes all fizzy drinks*
38. Milk Whole (As Drink) *includes plain or flavored whole milk drinks*
39. Milk Skimmed (As Drink) : *includes plain or flavored skimmed or semi-skimed milk drinks*
40 Sandwich, Meat Or Egg: *include both meat or egg sandwiches and burgers (white bread based)*
41. Sandwich Brown Bread : *includes any kind of wholemeal sanwiches or burgers*
42. Sandwich Asian (Stuffed Paratha) : *include paratha rolls or filled parathas*
43. Sandwich Vegetable: includes: *include both vegetable sandwiches and burgers (white bread based)*
44. Sandwich, Butter Or Margarine: *include white bread , toast or rolls with butter or margarine*
45. Sandwich, Jam : *include white bread , toast or rolls with jam or marmlade*
46. Sandwich, Peanut Butter : *white bread or roll with peanut butter*
47. Meat Pies: *all meat pies*
48. Baked Cheese And Veg.Savoury(Pizza) : *includes Pizza , quiche etc*
49 Pasta vegetable : *pasta with vegetable only*
50. Meat/Cheese Pasta : *pasta with meat and or cheese with or without vegetable*
51. Meat Pulao : *all asian rice and meat (lamb, mutton, chicken, beef) dishes*
52. Vegetable Pulao : *all asian rice and vegetable dishes*
53. English Ckd. Veg. (Baked Beans): *includes baked beans and other non asian cooked vegetables only dishes*
54. Curry, Meat: *all kinds of meat only (lamb, mutton or beef) curries*
55 Curry, Chicken : *all kinds of chicken curries*
56. Curry fish : *all kinds of fish curries*
57. Curry, Meat And Veg: *all kinds of meat and vegetable curries like meat and potato curry*
58. Curry, Peas,Beans Or Lentils : *all kinds of dhals, peas or beans curries*
59 Curyr lentil green vegetable . *curries with dhal and green vegetables*
60 Curry, Vegetable *all vegetables curries or bhajis excluding lentils, peas or beans curries.*
61 Kebab, Meat : *all lamb, mutton or beef kababs*
62 Boiled Or Grilled Meat *all boiled, grilled or microwaved meat*
63 Boiled Or Grilled Chicken *all boiled, grilled or microwaved chicken*
64 Boiled Or Grilled Fish *all boiled, grilled or microwaved fish*
65 Fried Meat *all fried or roasted meat*
66 Fried Fish *all fried fish - fillet, finger etc*
67 Fried Chicken *all fried chicken- wings, legs, nuggets etc*
68 Meat Sausage *all kinds of sausages*
69 Pudding, Ice Cream *all kinds of puddins and ice-creams*

70. Dessert, Asian : *all asian desserts like mithai, halwa, kheer etc.*
71. Soups: *all kinds of soups*
72. Tomato Sauce *tomato ketchup and toamto sauce*
73. Salad Dressing . *mayyonaise, salad cream etc*
74. Chutney : *all asian and non asinan chutneys and pickles*
75. Egg, Fried Or Scrambled
76. Egg, Boiled Or Poached
77. Spread, Butter Or Margarine: *butter or margarine mentioned separately without bread like with jacket potatoes*
78. Spreads, Other : *honey, jam, etc mentioned without bread*
79 Spreads, PUFA : *include flora and low fat margarines*
80. Sugar : *any kind of white or brown Sugar*

Appendix 12 a: Modal Meal Times* (24 Hr Clock) On Weekdays And Weekend Day According To Group

Eating Occasion	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Breakfast	7.00	7.00	7.00	9.00	6.00	8.00	8.00	9.00	8.00	10.0	8.00	9.00
Mid-morning	11.0	10.0	11.0	12.0	10.0	11.0	10.0	12.0	10.0	12.0	10.0	14.0
Mid-day meal	13.0	12.0	14.0	13.0	13.0	14.0	12.0	12.0	12.0	12.0	12.0	13.0
Afternoon snack	16.0	16.0	17.0	17.0	17.0	17.0	16.0	17.0	15.0	15.0	16.0	19.0
Evening meal	18.0	19.0	20.0	20.0	21.0	20.0	19.0	20.0	17.0	18.0	20.0	19.0
Evening snacks	19.0	20.0	21.0	22.0	21.0	22.0	21.0	20.0	20.0	20.0	20.0	21.0

* times are rounded to nearest hour
WD=week day, WE=week end

Appendix 12b: Percentage Of Children Who Took This Meal On Weekday Or Weekend Day According To Group

Eating Occasion	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n=46	n=40	n=83	n=71	n=60	n=56	n=90	n=70	n=30	n=24	n=65	n=52
Breakfast	100	100	97	97	98	92	92	100	96	100	100	96
Mid-morning	39	22	77	38	90	30	65	37	66	79	60	48
Mid-day meal	100	95	100	90	100	94	100	94	93	95	98	100
Afternoon snack	60	35	74	61	81	62	73	57	80	50	81	53
Evening meal	100	90	98	92	100	87	97	90	100	79	93	92
Evening snacks	21	8	34	23	38	25	28	14	60	33	46	38

Appendix 12c: Mean* Number Of Food Items Per Meal According To Group

Eating Occasion	GROUP											
	RrP		LaP		AfP		BrP		BrC		BrI	
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	n=46	*n=40*	*n=83*	*n=71*	*n=60*	*n=56*	*n=90*	*n=70*	*n-30*	*n=24*	*n=65*	*n=52*
Breakfast	2	2	2	2	2	2	2	2	2	2	2	2
Mid-morning	1	1	1	1	1	1	1	1	1	1	1	1
Mid-day meal	2	2	2	2	2	2	3	2	3	3	3	2
Afternoon snack	1	1	1	1	1	1	1	1	1	1	1	1
Evening meal	2	2	2	2	2	2	2	2	3	3	3	3
Evening snacks	1	1	1	1	1	1	1	1	1	1	1	1

*rounded to whole numbers

Appendix 12d: Minimum, Maximum, Mean And Modal Number Of Eating Occasions Per Day On Weekdays And Weekend Day According To Group

	GROUP											
	RrP		LAP		AfP		BrP		BrC		BrI	
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	n=46	*n=40*	*n=83*	*n=71*	*n=60*	*n=56*	*n=90*	*n=70*	*n-30*	*n=24*	*n=65*	*n=52*
Mode	3.0	3.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	5.0	3.0
Mean	4.0	3.8	4.6	4.6	5.0	4.4	5.1	4.3	5.2	5.0	5.4	4.7
Minimum	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	2.0
Maximum	7.0	9.0	7.0	8.0	8.5	9.0	9.0	9.0	8.5	8.0	9.0	9.0

Appendix 13a: Breakfast

Breakfast was usually eaten at home. (see table 3-5) More than 91% of children in any group ate breakfast at home. When not eaten at their own home it was eaten at other's home, outside (in the car mostly in the form of a sandwich) and occasionally at school on week days.

Whether it was a week day or a week end, the majority (62-79%) of all the three groups of British children ate their breakfast with their parents. In the Pakistani sample the majority of rural Pakistani children ate their breakfast with their parents on both week days and week ends (60 & 63%), while the majority of urban children, both the affluent as well as the less affluent ones (68 & 69%) ate their breakfast with their parents on week ends only. On week days only 19% of affluent and 36 % of less affluent urban Pakistani children ate their Breakfast with their parents. Urban children were more likely to have this meal with their siblings on week days (40 & 44%) than the rural children. (24%).

In urban areas of Pakistan children leave home for school much earlier than their fathers do (or parents if mother is also working); in most case mothers prepare the breakfast for children but do not necessarily eat their own breakfast at this time. The usual pattern is that the they prepare and serve it to the children and carry on with their own house work. If the oldest daughter is considered old enough to perform this duty she prepares and serves breakfast to other school children and she herself also eats with them. In rural areas the day starts early for the whole family (at around 6 am), and the school starts later than in urban areas, so the family has a chance to eat this meal together. Bread, (chapati or paratha) is cooked fresh, as is tea and if curry is eaten it is usually left over from the previous day. Fuel used for cooking is not always gas, but often kerosene oil stoves and in some cases wood, so in terms of convenience and economy also it suits them to eat the meal together.

Table A13a-i :Where And With Whom Children Ate Their Breakfast On Week Days And Week Ends, According To Group

Place	Group											
	RrP	RrP	LAP	LAP	AfP	AfP	BrP	BrP	BrC	BrC	BrI	BrI
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n-46	*n=40*	*n-83*	*n-71*	*n 60*	*n-56*	*n=90*	*n=70*	*n-30*	*n-24*	*n=65*	*n=52*
WHERE EATEN												
Home	99	96	97	94	94	96	98	97	98	92	97	94
School	0	0	1	0	3	0	0	0	2	0	0	
Other Home	0	2	1	3	1	2	1	3	0	4	0	4
Outside	1	2	1	3	2	2	1	0	0	4	3	2
WITH WHOM EATEN												
Alone	16	20	24	19	37	12	12	14	6	17	18	14
Parents	60	63	35	68	18	68	73	78	71	75	62	67
Siblings	24	17	40	9	44	14	14	4	21	4	19	12
Friends	0	0	0	0	1	0	0	0	2	4	0	
Relative	0	0	1	4	0	6	1	3	0	0	1	7

Comparison of foods consumed by the three groups of British children

Among breakfast foods the most significant difference on week days was in the consumption of plain breakfast cereals which were eaten with a higher frequency (59%) by Pakistani as compared to British Caucasian (31%) and British Indian (26%) children. The consumption of breakfast cereals by Pakistani children dropped markedly (20%) on week ends and so there was no significant difference in the consumption of this food on week ends. Although the differences were not statistically significant, it was noted that Caucasian and Indian children had a higher frequently of consumption of sugared and high fibre cereals indicating wider choices either available to or considered by the Caucasian and Indian children.

Another significant difference was in the consumption of fruit drinks and fizzy drinks on week days ($p=0.0003$ & 0.02 respectively). Both type of drinks were consumed with a higher frequency by the Caucasian children (14% & 10% respectively) as compared to Pakistani (0 & 1%) or Indian (2 & 2%) children. This difference in the consumption of fruit and fizzy drinks was not significant on week ends because of lower consumption of these drinks by the Caucasian children (4% & 4%).

A significant difference ($p<0\ 0001$) was also noted in the type of milk consumed with cereals on week days. British Pakistani and British Indian children consumed whole milk more often (61 & 45% respectively) than they did skimmed milk (16 & 18 % respectively) with cereals, while more of the British Caucasian group consumed skimmed milk (31 %). Although still present this trend was weaker at weekends. Caucasian children still consumed milk more often than South Asian ones but in all groups the frequency declined.

British Caucasian children also ate Jam sandwiches more frequently than the two Asian groups on both week days ($p<0.01$) and week ends (ns) but the difference was significant on week days only as Pakistani children ate jam sandwiches slightly more frequently on week ends than on week days (6 & 4%).

Although the change was not statistically significant it may be noted that Pakistani children had more frequent consumption of eggs and English bread both white and brown on week ends indicating that breakfast cereals were being replaced by these foods on week ends.

Comparison of foods consumed by British Pakistani and Pakistani children

British Pakistani children had a significantly higher frequency of consumption of breakfast cereals of any kind, milk consumed with cereals, sliced brown bread, fruit juice, butter or margarine sandwich, and boiled or poached eggs; and significantly lower consumption of Asian breads: chapati, paratha, puri, nan; meat, vegetable or lentil curries, Asian dessert and whole milk drinks, than any group of Pakistani children. Most of these foods (e.g. paratha, puri, nan, halwa etc.) were not eaten at all at breakfast by British Pakistani children. On the other hand breakfast cereals, the most popular item among British Pakistani children, were not eaten at all by any group of Pakistani children in Pakistan. Consumption of sliced white bread by British Pakistani children was significantly higher than the rural Pakistani children only. Urban Pakistani children had similar or higher consumption of white sliced bread than the British Pakistani children. Frequency of tea consumption by British Pakistani children (47 & 43% respectively on week days and week ends) was lower than the rural Pakistani (85 & 65%), but higher than the affluent Pakistanis (20 &23%) and closer to the less affluent urban Pakistani children (65 &45%), with the exception that on week days less affluent Pakistanis had a much higher consumption of tea while it remained the same for British Pakistani children.

Comparison of foods consumed by the three groups of Pakistani children

Consumption of chapati and parathas/puris, curries and tea was most frequent at the rural level and least common among the affluent urban children. While the reverse was true for egg sandwich, jam sandwich, and milk. Consumption of white bread was slightly higher among the less affluent group than the affluent ones but was much higher among both the urban groups in comparison to the rural one. As on week ends many of the urban children were eating bought asian fried bread (puri) which is typically eaten with halwa (asian dessert if eaten on other occasions) consumption of this asian dessert was higher among the urban children than among rural ones. All these differences were statistically significant.

Rural Pakistani children at breakfast mostly ate some kind of plain asian bread (33%) or fried bread (74%) with tea (80%) and/or curry (31%) or eggs (22%). Affluent urban Pakistanis on the other hand mostly ate white sliced bread (34%), milk (58%) and eggs (19%).

Table A13a-ii: Foods Consumed At Breakfast On Week Days According To Group

FOODS	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n–40	n–81	n 59	n–83	n=29	n=65
Breakfast Cereal, plain	***	****	0	1	2	59	31	26
Breakfast Cereal, sugared	ns	****	0	0	0	11	21	25
Breakfast Cereal, high fibre	ns	***	0	1	0	11	17	15
Milk Whole (with cereals)	**	****	0	0	0	61	28	45
Milk Skimmed (with cereals)	ns	****	0	0	0	16	31	18
Bread Asian, white	ns	***	9	21	8	0	0	0
Bread Asian, wholemeal	ns	****	33	32	12	4	0	0
Bread Asian, fried	ns	****	74	31	19	0	0	0
Bread English, white	ns	**	9	40	34	23	21	17
Bread English, wholemeal	ns	*	0	0	0	5	0	3
Bread English, fried	ns	ns	0	2	2	5	3	0
Yoghurt, plain	ns	*	7	9	3	0	0	0
Sweets (candies)	ns	ns	0	1	3	5	3	2
Fruit Yoghurt	ns	ns	0	2	7	0	0	2
Tea or Coffee	ns	****	80	65	20	47	28	34
Fruit Juice	ns	***	0	1	0	14	10	11
Fruit Drink	***	ns	0	0	0	0	14	2
Fizzy Drink	*	ns	0	0	0	1	10	2
Milk Whole (as drink)	ns	****	11	19	58	5	14	8
Sandwich, meat or egg	ns	ns	0	0	7	4	0	3
Sandwich, butter or margarine	ns	*	0	0	2	8	3	15
Sandwich, jam	*	*	0	1	8	2	17	6
Curry, meat	ns	ns	0	6	2	0	0	0
Curry, peas, beans or lentils	ns	****	24	15	2	0	0	0
Curry, vegetable	ns	ns	7	5	2	1	0	0
Dessert, Asian	ns	ns	2	5	5	0	0	0
Egg, fried or scrambled	ns	****	22	32	19	5	10	3
Egg, boiled or poached	ns	ns	2	1	3	6	0	2
Spread, butter or margarine	ns	ns	2	1	2	1	0	2
Spread, other	ns	*	0	5	0	0	0	0
Sugar	ns	ns	0	0	3	1	7	3

*=P< 05, **=P< 005, ***=P< 0005, ****=P< 00005

Table A13a-iii: Foods Consumed At Breakfast on Week Ends According To Group

FOODS	p (UK3)	p (PK4)	GROUP					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=46	n 81	n 52	n–70	n–24	n=50
Breakfast Cereal, plain	ns	****	0	1	0	20	21	14
Breakfast Cereal, sugared	ns	*	0	0	0	7	21	12
Breakfast Cereal, high fibre	ns	ns	0	1	0	1	8	6
Milk Whole (with cereals)	ns	****	0	0	0	23	33	26
Milk Skimmed (with cereals)	ns	*	0	0	0	6	21	8
Bread Asian, white	ns	*	5	13	4	0	0	2
Bread Asian, wholemeal	ns	*	28	23	12	7	0	2
Bread Asian, fried	ns	****	55	38	35	1	0	0
Bread English, white	ns	*	3	22	31	27	8	24
Bread English, wholemeal	ns	***	0	0	0	11	4	4
Yoghurt, plain	ns	*	5	9	4	0	0	4
Tea or Coffee	ns	****	65	43	23	43	25	36
Fruit Juice	ns	*	0	0	0	7	0	6
Milk Whole (as drink)	ns	****	3	9	29	0	4	4
Sandwich, meat or egg	ns	ns	0	0	6	1	0	2
Sandwich, butter or margarine	ns	*	0	0	0	6	0	6
Sandwich, jam	ns	ns	0	0	0	4	17	6
Curry, meat	ns	ns	3	6	2	1	0	0
Curry, peas, beans or lentils	ns	ns	8	12	13	3	0	0
Curry, vegetable	ns	***	15	0	2	1	0	0
Dessert, Asian	ns	**	3	17	12	0	0	0
Egg, fried or scrambled	ns	ns	13	22	31	14	0	6
Egg, boiled or poached	ns	*	0	0	4	9	8	4
Spread, butter or margarine	ns	ns	3	7	2	3	0	0
Spread, other	ns	ns	0	1	6	3	0	0

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 13b: Mid morning Snack

The mid morning snack was eaten mostly at school on week days and at home on week ends by the majority of children in all of the six groups. Rural Pakistani children were somewhat different from the other groups in that they ate outside more often (43%) than any of the other groups of children. Probably they had fewer restrictions on doing so.

Among the three UK and two Urban Pakistani groups the pattern of eating at mid morning snack was similar, on week days it was taken most frequently with friends and on week ends most frequently with parents. Rural Pakistani children had this snack mostly with their friends or alone and less often with parents or siblings than the other groups. A quarter of affluent urban Pakistani children had their mid morning snack with relatives on week ends.

Table A13b-i:Where And With Whom Children Ate Their Mid Morning Snack

	GROUP											
	RrP	RrP	LAP	LAP	AfP	AfP	BrP	BrP	BrC	BrC	BrI	BrI
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n-46	n 40	n-83	n 71	n 60	n 56	n-90	n-70	n-30	n=24	n=65	n=52
WHERE EATEN												
Home	19	50	14	85	15	70	22	78	20	81	12	76
School	62	0	82	0	80	0	71	0	74	0	78	
Other Home	5	7	0	10	0	20	1	11	0	4	4	15
Outside	14	43	4	5	6	10	6	11	6	15	5	9
WITH WHOM EATEN												
Alone	30	23	20	47	27	30	21	28	10	15	16	26
Parents	8	15	4	26	6	10	14	39	18	59	9	53
Siblings	11	15	5	18	4	35	2	19	6	7	3	9
Friends	49	38	71	0	63	0	61	3	65	19	72	
Relative	3	8	0	8	0	25	2	11	0	0	0	12

Comparison of foods consumed by the three groups of British children

The frequency of consuming crisps was significantly higher among British Caucasian children both on week days and week ends (20 &47°o) as compared to British Indian (31 & 20%) or British Pakistani children (24 & 15 °o) However chocolates were eaten significantly more frequently by British Caucasian children (47°o) in comparison to British Pakistanis (15%) and British Indians (20°o) only at the week ends. It is interesting to note that the Indian and Pakistani children ate chocolates less frequently on week ends than week days while the reverse was true for the British Caucasian children. At weekends the most commonly consumed snack items were fruit (BrP), crisps (BrC) and biscuits (BrI) (see table 4-9)

Comparison of the foods consumed by the British Pakistani and Pakistani children

British Pakistani children consumed crisps and chocolates (p=0.00000 & p=0.00007) significantly more frequently in comparison to any of the three groups of children in Pakistan. Consumption of asian desserts (p=0.001) was significantly higher in all the three groups of Pakistani children when compared with British Pakistani children. British Pakistani children were similar to affluent Pakistanis in the frequency of consuming Asian breads, 'chat' (chickpea snack), lentil curry, vegetable curry, and kababs at midmorning on either week days or week ends. Both the groups of children consumed these foods less frequently than the less affluent urban or rural Pakistani children. On the other hand consumption of sliced white bread and meat sandwiches was significantly lower among the less affluent and rural Pakistani children and as British Pakistani children also had lower consumption of these foods they were closer to less affluent and rural Pakistani children rather than affluent Pakistanis Pakistani in this case. Both of the urban Pakistani groups ate ice cream at this time of the day more frequently than the rural Pakistani children. British Pakistani children never had ice cream or pudding at this snack, so they were more like the rural Pakistani in this instance. British Pakistani children had lower consumption of ice creams and asian desserts on week ends also than the urban Pakistani children. It seems that at this particular snack all children in Pakistan consumed a wider variety of foods than the British Pakistani children. This is understandable because this snack is of differing importance to the two groups. British Pakistani children have their breakfasts later than the Pakistani children (may be because of the later school time) and mid-day meal earlier than the Pakistani children at 12noon/12.30, consequently eating something at snack time may not be very important to them Whereas most of the Pakistani children, particularly urban children have their Mid-day meal later at home at about 1.30/2:00 p m., so for most of them it is vital to eat something filling at morning snack time. The rural children were different in the sense that for them the day starts earlier, most of them wake up at 5 or 6 am and the school timings are later than the urban ones (8:30-1:30 instead of 7:30 to 12:30) so at the school canteen, typical meal items like nan and curry were also available all morning and eaten as a snack by many children. However for some of them it was their main mid day meal (they didn't eat meal type foods on reaching home) while some others ate them as a snack and had their full mid-day meal at home later. So at this snack time differences in food consumption were not only because of availability and choice but also because of the differing importance of the snack for different groups of children. This view is supported by the fact that the number of significant differences was 18 on week days and only 3 on week ends.

Comparison of foods consumed by the three groups of Pakistani children

In Pakistan both the urban groups in general and the affluent ones in particular ate more western snacks than the rural children at this time. For the majority of children eating something substantial was not essential and consequently, sweets and biscuits were popular items among the three groups, while crisps and ice creams were eaten more often by the urban than the rural children. However among those children who left home very early and came back late, (due to distance and/or transportation,) eating something filling was important. In such cases foods available at the affluent urban school were burgers and 'chat' and 'samosas' but no curries or 'nan', but at the less affluent rural and urban schools 'nan' and potato 'bhaji' or 'tikki' (kabab) were also available. Similarly when the affluent children brought packed morning snack it was mostly sandwiches while the less affluent urban also brought 'bhaji' and paratha. The most commonly consumed mid morning snack for rural, less affluent and affluent urban Pakistani children was 'chat', 'naan-tikki', and 'samosas' on week days. At the week ends the most commonly consumed mid morning snacks were mithai (RrP), fruit (LaP) and ice-cream or biscuits (AfP).

Table A13b-ii: Foods Consumed At Mid Morning snack On Week Days According To Group

FOODS	p (UK3)	p (PK4)	GROUPS					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n-18	n-64	n 54	n-59	n-20	n=39
Bread Asian, white	ns	*	6	0	0	0	0	0
Bread Asian, wholemeal	ns	****	44	41	9	0	0	0
Bread Asian, fried	ns	*	0	3	9	0	0	0
Bread English, white	ns	**	0	3	15	0	0	0
Yoghurt, plain	ns	*	6	0	0	0	0	0
Crisps	*	****	0	16	22	73	85	54
Pop Corns etc.	ns	*	0	6	0	0	0	3
Asian Snacks (chat, chevda)	ns	****	22	22	0	0	0	0
Asian Snacks, (pakora, samosa)	ns	ns	11	9	31	0	0	0
Sweets (candies)	ns	ns	28	23	26	34	40	31
Chocolates	ns	****	0	0	9	24	20	31
Biscuits	ns	ns	22	13	11	15	20	5
Cakes	ns	ns	6	0	2	8	5	13
Fruits	ns	ns	6	6	4	3	5	8
Tea or Coffee	ns	****	17	0	2	22	20	10
Fruit Juice	ns	ns	0	5	2	5	5	8
Fruit Drink	ns	ns	6	3	4	7	10	8
Fizzy Drink	ns	ns	17	8	19	7	5	10
Milk Whole (as drink)	ns	ns	6	3	2	3	5	3
Sandwich, meat or egg	ns	****	0	2	35	0	0	0
Curry, peas, beans or lentils	ns	**	22	11	4	0	0	0
Curry, vegetable	ns	****	6	33	0	0	0	0
Kebab, meat	ns	***	11	0	0	0	0	0
Pudding, Ice Cream	ns	*	0	6	11	0	0	0
Dessert, Asian	ns	**	6	16	2	0	0	0
Chutney	ns	****	22	2	2	0	0	0
Egg, fried or scrambled	ns	ns	6	2	4	0	0	0
Boiled or Grilled Meat	ns	ns	0	0	0	0	5	0

*=P<.05, **=P<.005, ***=P< 0005, ****=P< 00005

Table A13b-iii: Foods Consumed At Mid Morning snack On Week End Days According To Group

FOODS	p (UK3)	p (PK4)	GROUPS					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=9	n 27	n 17	n 26	n–19	n–25
Breakfast Cereal, plain	ns	ns	0	0	0	8	0	4
Milk Whole (with cereals)	ns	ns	0	0	0	4	0	8
Bread Asian, white	ns	*	11	0	0	0	0	0
Bread Asian, fried	ns	ns	0	0	12	0	0	0
Raw or Boiled Vegetables	ns	ns	0	0	6	0	0	0
Crisps	*	ns	0	7	12	23	47	12
Asian Snacks (chat, chevda)	ns	ns	11	15	6	0	0	0
Asian Snacks, (pakora, samosa)	ns	ns	0	0	0	8	0	4
Vegetable Patties	ns	ns	0	4	0	0	0	0
Sweets (candies)	ns	ns	22	7	12	23	26	16
Chocolates	*	ns	0	0	6	15	47	20
Biscuits	ns	ns	11	22	24	8	5	24
Cakes	ns	ns	0	0	18	8	16	12
Fruits	ns	ns	33	26	6	27	5	12
Nuts	ns	ns	0	0	6	0	0	0
Tea or Coffee	ns	ns	0	19	6	15	16	20
Fruit Juice	ns	ns	0	7	0	12	0	8
Fruit Drink	ns	ns	11	0	6	12	16	4
Fizzy Drink	ns	ns	11	19	6	23	11	20
Milk Whole (as drink)	ns	ns	0	4	0	8	5	0
Milk Skimmed (as drink)	ns	ns	0	0	0	4	5	0
Vegetable Pulao	ns	ns	0	0	6	0	0	0
Pudding, Ice Cream	ns	*	0	22	24	0	0	0
Dessert, Asian	ns	****	44	0	6	0	0	0
Chutney	ns	ns	0	0	6	0	0	0

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 13c: Mid-day meal

In Pakistan the school finishes at midday and typically the children eat their mid-day meal at home. However in the rural areas as their day starts and ends much earlier than the urban children, their meal times are also at least one to two hours ahead of the urban children. As the typical meal foods were available alongside snacks in the school canteen of the rural school some of the children preferred to have their mid day meal at school rather than waiting until they reached home. So in Pakistan although the majority of children from all groups ate their mid-day meal at home, the frequency of eating the mid-day meal at school was comparatively much higher for the rural group.

The three groups of UK children had their mid-day meal most frequently with friends on week days and with parents on week ends. Although all the three groups of children in Pakistan had their mid-day meal most frequently with parents on both the week days as well as on week ends, the relative frequency of consuming the mid-day meal with parents was lower for rural Pakistani children. They had this meal more often with siblings only than the urban Pakistani children. Another similarity noted in all the three Pakistani groups was that frequency of eating mid-day meal with parents was higher on week end in relation to week days.

Eating the mid-day meal at other's home was more common on week ends than on week days for all the six groups. But all of the Asian groups had the mid-day meal more often at 'other's home' on week ends than the British Caucasian children. But eating the mid day meal at other's home at the week ends was more common in all the South Asian groups than among the Caucasians and serves to illustrate the importance of food and socialising in South Asian culture.

Table A13c-i:Where And With Whom Children Ate Their Mid-Day Meal On Weekdays And Weekends According To Group

	GROUP											
	RrP	RrP	LAP	LAP	AfP	AfP	BrP	BrP	BrC	BrC	BrI	BrI
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n=46	*n=40*	*n=83*	*n=71*	*n-60*	*n=56*	*n-90*	*n=70*	*n-30*	*n=24*	*n=65*	*n=52*
WHERE EATEN												
Home	83	95	95	87	98	89	34	87	23	69	40	82
School	15	0	1	0	0	0	59	0	71	0	51	
Other Home	0	5	3	10	1	6	2	7	0	4	2	11
Outside	1	0	1	3	1	6	5	6	6	27	7	7
WITH WHOM EATEN												
Alone	22	16	18	16	17	2	12	9	11	4	9	12
Parents	47	57	63	71	67	76	26	78	18	79	28	69
Siblings	19	22	14	3	15	11	2	5	0	0	8	11
Friends	12	0	1	0	0	0	58	0	71	14	53	3
Relative	0	5	3	10	1	11	1	9	0	4	3	5

WD=week day, WE=week end

Comparison of foods consumed by the three groups of British children

Ethnic differences in the consumption of foods were evident more often at the mid-day meal than at breakfast and mid morning.

On week days Caucasian children ate meat and egg sandwiches and fruit more frequently than the Indian and Pakistani children (64% BrC vs 48 BrC & 24 % BrP) and fruit juice less frequently than the Indian and Pakistani children (11% BrC vs 36% BrI & 21% BrP). Fried fish was eaten more frequently by Pakistani children than the Indian and Caucasian children (38% BrP vs 22 BrI & 14% BrC) and eggs were eaten with a higher frequency by the Indian children than the British Caucasian and British Pakistani children (11% BrI vs 4 BrC & 1% BrP). Nearly 20% of Indian and Pakistani children ate chapati on week days at the mid-day meal indicating that those who went home for the mid-day meal often ate a traditional meal. The number of children who went home for lunch was not sufficient for detailed statistical analysis but a crude comparison indicated that about 30% of South Asian children who went home for their mid-day meal ate similar foods as were served as school. According to information provided in the questionnaires, (see appendix 11b) 9% each of British Pakistani and British Caucasian and 12 % of British Indian children went home for Mid-day meal. However food records indicated that a higher percentage of children than indicated in questionnaires (18% BrC, 28% BrI, and 26% of BrP) went home for their mid-day meal.

Children's responses to the questionnaires regarding the type of lunch eaten the previous day indicated that 23% of BrP, 21% of BrC, and 32% of BrI ate a packed lunch (see appendix 11b).

At week ends the differences were rather more marked because some of the western foods which were being offered at school mid-day meal were being eaten less frequently at home by the Indian or Pakistani children. All of the three groups were probably having more typical traditional foods more frequently so the difference was marked enough to be statistically significant. Caucasian children had significantly higher consumption of chips, other potatoes, raw or boiled vegetables, meat pies, fried chicken, boiled/grilled meat and significantly lower consumption of chapati, or any curries. Both the Asian groups had a higher consumption of yoghurt as compared to Caucasian children but the frequency of consuming yoghurt was also significantly higher among British Indians in comparison to British Pakistani children. The two Asian groups differed less markedly in the consumption of vegetable curries (17% BrP & 23% BrI) than they did in the consumption of chicken curry or lentils. Chicken curry was eaten more frequently by Pakistani children (11% vs 2%) and lentils by the Indian children (17% vs 5%).

Although there is no information about vegetarianism among the Indian children, 21% of Indian children were Hindu and 79% were Sikh, and a certain proportion of them might have been vegetarian. Intra-group comparison of responses to questionnaires by the Indian children revealed that the two religious subgroups did not differ in their consumption of meat. When Pakistani Muslims were compared with Indian Hindu and Sikh a slightly higher proportion of Pakistani children (69%) indicated never eating meat than Indian Hindu (53%) or Indian Sikh (56%) children. The reported consumption of meat burgers was significantly higher in both the Indian subgroups as compared to the British Pakistani group. Ninety three percent of British Pakistani and 40% each of Indian Hindu and Sikh children indicated never eating meat burgers. Nearly forty percent of children from each group mentioned never eating chicken but a markedly higher proportion (21%) of British Pakistani children mentioned eating chicken on most days as compared to less than 10% of either Indian Hindu or Sikh children. These findings do not suggest any overall tendency of vegetarianism among Indian Hindu or Sikh children.

Comparison of the food consumed by the British Pakistani and Pakistani children

Due to the factors discussed above the mid-day meal on week days was also very different when British Pakistani and Pakistani children were compared. British Pakistani children were most exposed to western food choices at this meal and least likely to consume traditional foods. Consequently the consumption of all the foods typically served at school mid-day meal or taken as packed mid-day meal was significantly higher: English bread, chips, other potatoes, crisps, sweets, chocolates, biscuits, cakes, fruit juice, fruit drinks, fizzy drinks, meat or egg sandwiches, vegetable sandwiches, jam sandwiches, pizza, baked beans, fried fish, tomato ketchup; was significantly higher. Consumption of traditional foods like Asian breads or curries was significantly lower among the British Pakistani children. Although the number of significant differences decreased by 50% on week ends, there was still significantly higher consumption of English white bread, chips, tea, fruit juice, fruit drink, fizzy drink, pizza, baked beans, fried fish, and tomato ketchup; and significantly lower consumption of Asian breads and meat and vegetable curries, vegetable and lentil curries by British Pakistani children as compared to any group in Pakistan. Consumption of 'meat only' curries was lower among British Pakistani children (14%) than urban children in Pakistan (23% LaP & 25% AfP) and higher than that of rural Pakistani children (5%). Consumption of ice-cream / puddings and fruit was higher among the affluent urban Pakistanis than the less affluent and rural Pakistanis and British Pakistani children were more like affluent Pakistanis than the two other groups.

Comparison of foods consumed by the three groups of Pakistani children

The basic pattern of the mid-day meal was the same for all the three groups of children in Pakistan; consisting of chapati (sometimes accompanied or replaced by rice) and curry, the main difference between the three groups was in the type of curry eaten. Meat, meat-vegetable and chicken curry were consumed more frequently at the affluent urban level and least frequently at the rural level However the difference was only statistically significant for chicken curry and meat-vegetable curry. At this meal there was no significant difference between the three groups in the frequency of consuming lentils or vegetable curries. Consumption of fruit and ice cream was however significantly higher among the affluent Pakistanis than the other two groups.

Difference in the consumption of chicken curries was similar and significant on week ends also. The difference in the consumption of meat only curry which was not significant on week days, became significant on week ends due to the higher consumption by affluent and less affluent urban children and lower consumption by rural Pakistani children in relation to week days. Rural children ate rice dishes (meat 'pulao' and vegetable 'pulao') more often on week ends than the week days (so probably the urban preferred to eat more meat /chicken curries and rural more 'pulao' on week ends)

Another difference noted on week ends only was the significantly higher consumption of fizzy drinks by the affluent Pakistanis than by the less affluent or rural Pakistani children.

Table A13c-ii: Foods Consumed At Mid-day meal On Week Days According To Group

Foods	p (UK3)	p (PK4)	Groups					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n-46	n 83	n=60	n=90	n-28	n=64
Bread Asian, white	ns	ns	0	0	0	19	0	20
Bread Asian, wholemeal	*	****	80	87	85	0	0	5
Bread Asian, fried	ns	**	17	11	5	18	14	27
Rice, plain (boiled)	ns	***	11	24	23	3	0	0
Pasta, plain	ns	ns	0	0	2	0	7	3
Cheese	ns	ns	0	0	0	3	7	9
Yoghurt, plain	ns	ns	7	7	13	3	7	13
Potato Chips, fried	ns	****	0	0	2	61	68	50
Raw or Boiled Vegetables	ns	ns	0	6	10	12	4	8
Other Potato (jacket, mashed)	ns	****	0	0	0	19	4	23
Crisps	ns	****	0	0	0	23	25	33
Sweets (candies)	ns	**	0	0	0	8	14	6
Chocolates	ns	**	0	0	0	7	7	17
Biscuits	ns	****	0	0	2	19	29	9
Cakes	*	****	0	0	2	44	39	22
Fruits	*	*	4	2	15	14	29	5
Tea or Coffee	ns	**	0	1	3	13	4	19
Fruit Juice	*	****	0	0	0	21	11	36
Fruit Drink	ns	****	0	1	2	56	57	61
Fizzy Drink	ns	****	0	1	3	22	36	25
Milk Whole (as drink)	ns	ns	2	2	3	7	14	5
Sandwich, meat or egg	***	****	0	0	2	24	64	48
Sandwich Vegetable	ns	****	0	0	0	12	0	8
Sandwich, butter or margarine	ns	ns	0	0	0	3	0	8
Sandwich, jam	ns	*	0	0	0	6	11	9
Sandwich, peanut butter	ns	ns	0	0	0	2	7	3
Pizza/Quiche	ns	****	0	0	0	17	18	13
Vegetable Pulao	ns	*	9	13	15	1	0	0
English Ckd. Veg. (bkd beans)	ns	****	0	0	0	60	46	53
Curry, Meat	ns	*	13	19	18	6	0	0
Curry, Chicken	ns	***	4	7	23	3	0	3
Curry, Meat and Veg.	ns	****	9	28	30	2	0	3
Curry, peas, beans or lentils	ns	****	52	52	43	4	0	2
Curry, vegetable	ns	***	39	30	30	9	0	14
Kebab, Meat	**	ns	2	2	3	0	7	0
Boiled or Grilled Fish	*	ns	0	0	0	1	7	0
Fried Fish	*	****	0	0	0	38	14	22
Meat Sausage	*	ns	0	0	0	0	4	8
Pudding, Ice Cream	ns	*	0	0	5	7	7	5
Dessert, Asian	ns	ns	7	2	10	1	0	2
Tomato Sauce	ns	**	0	0	0	9	4	9
Egg, fried or scrambled	*	ns	9	2	5	1	4	11

*=P< 05, **=P< 005, ***=P< 0005, ****=P< 00005

Table A13c-iii: Foods Consumed At Mid-day meal On Week Ends According To Group

Foods	p (UK3)	p (PK4)	Groups					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n 38	n=64	n 53	n=66	n=23	n=52
Bread Asian, wholemeal	**	****	63	72	66	32	0	40
Bread Asian, fried	ns	ns	8	3	0	2	0	2
Bread English, white	ns	***	0	0	0	12	0	12
Rice, plain (boiled)	ns	ns	11	3	17	0	0	0
Rice, fried	ns	ns	0	0	0	11	0	12
Cheese	ns	ns	0	0	0	2	9	4
Yoghurt, plain	*	ns	5	6	13	8	0	19
Gravy	ns	ns	0	0	0	0	9	4
Potato Chips, fried	*	****	0	0	0	20	48	23
Raw or Boiled Vegetables	***	ns	5	8	6	6	39	10
Other Potato (jacket, mashed)	**	ns	0	0	0	5	22	0
Crisps	ns	ns	0	0	0	5	4	4
Fruits	ns	ns	0	5	6	6	9	0
Tea or Coffee	ns	ns	0	2	2	6	4	10
Fruit Juice	ns	*	0	0	0	8	0	6
Fruit Drink	ns	*	0	0	2	8	13	4
Fizzy Drink	ns	**	0	0	8	17	13	19
Sandwich, meat or egg	**	ns	0	0	0	2	26	12
Meat Pie	ns	ns	0	0	0	0	13	0
Baked Cheese and Veg. Savoury	ns	*	0	0	2	8	0	12
Meat Pulao	ns	ns	5	13	6	2	0	0
Vegetable Pulao	ns	ns	13	6	8	2	0	2
English Ckd. Veg. (bkd beans)	ns	****	0	0	0	14	17	8
Curry, Meat	ns	*	5	25	23	14	0	8
Curry, Chicken	ns	*	5	5	23	11	0	2
Curry, Meat and Veg.	ns	*	5	19	9	2	4	0
Curry, peas, beans or lentils	*	*	26	19	17	5	0	17
Curry, vegetable	ns	ns	21	11	13	17	0	23
Kebab, Meat	ns	ns	3	3	11	5	0	2
Boiled or Grilled Meat	*	ns	0	0	0	0	13	4
Fried Meat	*	ns	0	0	2	0	9	0
Fried Fish	*	****	3	0	0	18	4	4
Fried Chicken	**	ns	0	0	0	0	13	2
Pudding, Ice Cream	ns	ns	0	0	2	3	4	10
Tomato Sauce	ns	**	0	0	0	11	0	2
Chutney	ns	ns	5	5	4	2	4	0
Egg, fried or scrambled	ns	ns	0	0	0	5	4	4

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 13d: Afternoon Snack

The majority of the children from any of the six groups (70-88%) had this snack at home. The frequency of eating this snack at other's home was higher on week ends than on week days for all the six groups. As seen in the case of mid morning snack frequency of eating outside at this time on week ends was again higher for the rural Pakistani children as compared to other Pakistani children.

The three groups of UK children mostly had their afternoon snack with a parent. The British and the British Indian children had this snack more frequently with their parents on week ends (65% BrC & 60 % BrI respectively) than on week days (55% BrC & 42% BrI % respectively). British Pakistani children on the other hand took this meal slightly less frequently with their parents on week ends than on week days. They instead had it more often with relatives on week ends (12%) as compared to week days (2%).

The three groups of children in Pakistan had their Afternoon Snack mostly with parents on week ends only. On week days frequency of eating this snack with parents or alone was similar both for the rural (40% parents, 40% alone) and affluent urban Pakistani (31% parents, 30% alone) groups.

Less affluent urban Pakistani children had this snack more often alone (41%) than with parents (30%).

Table A13d-i:Where And With Whom Children Ate Their Afternoon Snack On Weekdays And Weekends According To Group

	GROUP											
	RrP	RrP	LAP	LAP	AfP	AfP	BrP	BrP	BrC	BrC	BrI	BrI
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n=46	*n 40*	*n=83*	*n-71*	*n-60*	*n=56*	*n=90*	*n=70*	*n-30*	*n=24*	*n=65*	*n=52*
WHERE EATEN												
Home	80	70	85	70	87	77	82	78	78	88	81	81
School	0	0	0	2	2	0	5	0	4	0	3	
Other Home	4	5	4	11	3	8	3	10	0	12	8	7
Outside	16	25	11	16	8	15	10	12	18	0	7	12
WITH WHOM EATEN												
Alone	40	25	41	33	31	31	35	26	29	24	29	24
Parents	40	40	30	49	30	54	50	45	55	65	42	60
Siblings	10	30	18	3	31	6	6	12	4	0	15	17
Friends	10	5	3	2	2	0	6	5	12	12	11	0
Relative	0	0	8	13	6	8	2	12	0	0	3	0

Comparison of foods consumed by the three groups of British children

The three groups of children differed significantly in the consumption of sugared breakfast cereals, sweets, and fruit drinks at afternoon snack time on week days and in the consumption of biscuits and fizzy drinks on week ends. On week days breakfast cereals were eaten by 5% of British Pakistani and & 6 % British Indian children and by none of the British Caucasian children. Sweets were eaten most often by the Pakistani children (36% BrP vs 21% BrC & 13% BrI) and fruit drinks by Caucasian children (25% BrC vs 9% BrI & 6% BrP). On week ends Indian children had significantly lower consumption of biscuits (0%) as compared to British Caucasian (25%) or British Pakistani children (18%). Pakistani children at week ends, consumed fizzy drinks less frequently (3%) than any other British group (25% BrC & 29% BrI).

Crisps and chocolates were popular among all the three groups. Although the difference did not reach statistical significance, there was a trend for both the South Asian groups to eat crisps more frequently than British Caucasian children. British Pakistani children had the highest frequency of consuming both crisps and chocolates as an afternoon snack on week days as well as at the week end

Comparison of foods consumed by the British Pakistani and Pakistani children

Differences between British Pakistani and Pakistani children in the foods eaten at this time on week days were in some cases similar to that noticed at midmorning snack time. British Pakistani children had higher consumption of crisps and chocolates than any of the Pakistani group, while Pakistani children ate Asian snacks more frequently than British Pakistani children. British Pakistani children also had significantly lower consumption of tea, milk drinks, ice creams, asian desserts and higher consumption of breakfast cereals than any group of Pakistani children. These differences (with the exception of tea, breakfast cereals and ice cream) also occurred at week ends and were statistically significant.

Comparison of foods consumed by the three groups of Pakistani children

There were no significant differences on week days, but on week ends rural Pakistani children had significantly higher consumption of pakora/ samosas and asian desserts (sweets) than the other two groups, while the affluent urban children had significantly higher consumption of cakes than the other two groups.

Table A13d-ii: Foods Consumed At Afternoon Snack time On Week Days According To Group

FOODS	p (UK3)	p (PK4)	GROUPS					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=28	n=62	n=49	n=66	n=24	n=53
Breakfast Cereal, plain	*	***	0	2	0	15	8	0
Breakfast Cereal, sugared	ns	ns	0	0	0	5	0	6
Breakfast Cereal, high fibre	ns	ns	0	2	0	6	0	2
Milk Whole (with cereals)	ns	****	0	0	0	15	4	6
Milk Skimmed (with cereals)	*	*	0	0	0	8	0	0
Bread Asian, white	ns	ns	0	5	8	0	0	0
Potato Chips, fried	ns	ns	0	5	0	0	0	0
Crisps	ns	****	0	11	10	35	13	25
Asian Snacks (chat, chevda)	ns	**	11	19	14	0	0	0
Asian Snacks, (pakora. samosa)	ns	*	11	3	10	0	2	2
Sweets (candies)	*	ns	21	21	27	36	21	13
Chocolates	ns	****	0	3	6	33	29	21
Biscuits	ns	ns	25	21	18	21	21	17
Cakes	ns	ns	4	3	6	26	17	25
Fruits	ns	ns	25	23	33	32	17	36
Tea or Coffee	ns	*	43	45	47	21	21	15
Fruit Juice	ns	ns	0	3	8	8	4	19
Fruit Drink	*	ns	4	5	6	6	25	9
Fizzy Drink	ns	ns	0	16	12	11	29	19
Milk Whole (as drink)	ns	*	21	18	22	5	4	15
Pudding, Ice Cream	ns	**	7	21	18	2	0	0
Dessert, Asian	ns	**	25	16	14	0	0	0

*=P<.05, **=P<.005, ***=P<.0005, ****=P< 00005

Table A13d-iii: Foods Consumed At Afternoon On Week End Days According To Group

FOODS	p (UK3)	p (PK4)	GROUPS					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n 14	n–44	n 35	n=40	n=12	n=28
Breakfast Cereal, plain	ns	ns	0	0	0	0	8	4
Breakfast Cereal, sugared	ns	ns	0	0	0	8	0	0
Milk Whole (with cereals)	ns	ns	0	0	0	5	8	7
Bread Asian, white	ns	ns	0	7	0	0	0	0
Bread Asian, wholemeal	ns	ns	0	5	3	0	0	0
Crisps	ns	ns	0	7	3	30	17	32
Asian Snacks (chat, chevda)	ns	ns	7	2	14	3	0	0
Asian Snacks, (pakora, samosa)	ns	*	21	2	3	5	0	4
Sweets (candies)	ns	ns	0	16	11	13	8	18
Chocolates	ns	***	0	2	3	25	8	11
Biscuits	*	ns	36	18	26	18	25	0
Cakes	ns	**	0	0	23	13	33	21
Fruits	ns	ns	14	14	20	23	17	18
Tea or Coffee	ns	ns	36	39	29	18	33	7
Fruit Juice	ns	ns	0	5	0	13	8	14
Fruit Drink	ns	ns	0	2	3	3	8	0
Fizzy Drink	*	ns	0	14	17	3	25	29
Milk Whole (as drink)	ns	ns	7	2	14	0	0	4
Curry, Meat	ns	ns	0	5	0	0	0	0
Curry, Meat and Veg.	ns	ns	0	0	6	0	0	0
Pudding, Ice Cream	ns	ns	7	14	14	0	0	0
Dessert, Asian	ns	**	36	16	6	0	0	0
Chutney	ns	ns	0	5	0	0	0	0

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 13e: Evening meal

In each group, a relatively higher proportion of children ate this meal on week days (93-100%) than on week end days (79-92%). The greatest difference in this regard was noted among British Caucasian children. None of them missed this meal on week days but 21% skipped it on week ends. Among the Pakistani children affluent urban ones skipped this meal most often; 13% children from the affluent group, 8% of less affluent urban and 10% of rural Pakistani children skipped this meal.

All the six groups ate their evening meals mostly (82-100%) at home. Among the British children British Caucasian had evening meals at home more frequently than the others and never had it at other's home. The British Indian children had their evening meal at home less frequently and at other's home more frequently than the British Pakistani children on both week days and week ends.

For the Pakistani children, at week ends the frequency of eating the evening meal at home increased and the frequency of eating outside decreased with the decline in socio- economic status. Ten percent of the children from the affluent urban, 6% of the less affluent urban and 3% of the rural group had their evening meal outside on week ends.

In all the six groups, children usually had their evening meals with their parents.

Table A13e-i:Where And With Whom Children Ate Their Evening Meal On Weekdays And Weekends According To Group

	GROUP											
	RrP	RrP	LAP	LAP	AfP	AfP	BrP	BrP	BrC	BrC	BrI	BrI
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n-46	*n 40*	*n-83*	*n 71*	*n 60*	*n 56*	*n 90*	*n 70*	*n-30*	*n-24*	*n-65*	*n=52*
WHERE EATEN												
Home	100	97	97	88	94	86	96	88	94	96	88	82
Other Home	0	0	1	5	4	4	3	7	0	0	9	14
Outside	0	3	1	6	2	10	1	4	5	4	2	4
WITH WHOM EATEN												
Alone	11	14	11	9	14	4	13	14	17	4	6	9
Parents	71	67	72	78	70	77	81	75	80	88	80	79
Siblings	17	19	14	6	13	9	4	4	2	8	7	4
Friends	0	0	0	2	0	0	1	1	2	0	3	2
Relative	0	0	3	5	3	11	1	6	0	0	3	7

Comparison of foods consumed by the three groups of British children

Foods eaten at the evening meal by the three groups of children in general revealed the similar differences as were seen at the mid-day meal. The differences were more marked at the evening meal than at the mid day meal because both the South Asians groups were eating more traditional foods at evening meals than at mid day meal.

On week days British Pakistani and British Indian children consumed white bread, chips, boiled vegetables, other potatoes, crisps, cake, fruit drinks, jam sandwiches, meat pies, boiled or grilled meat, fried meat, fried chicken, and meat sausages significantly less frequently and chapati, meat curry (Pakistani only), chicken curry (British Pakistani only) and vegetable curries significantly more frequently than the Caucasian children. At the week end some of these differences were less marked and were significant only in the case of chips, jam sandwich, meat sausages, chapati and vegetable curry. On the other hand differences in the consumption of two other foods were significant at the week end. Tea or coffee and meat sandwiches and burgers were eaten significantly more frequently by the Caucasian children.

Comparison of foods consumed by the British Pakistani and Pakistani children

In comparison to the mid-day meal the evening meal had fewer significant differences both on week days and week ends. Probably because of being eaten at home they were more traditional for British Pakistani children. The differences which were still evident both on week days and week ends included higher consumption of white English bread, chips, raw or boiled vegetables, fruit juice, fried chicken, and lower consumption of vegetable 'pulao' and lentil curries by the British Pakistani children in comparison to any group of children in Pakistan. Fruit drinks, fizzy drinks and pizza were consumed more frequently by the British Pakistani children only on week days. British Pakistani children were closer to affluent Pakistanis in the consumption of chicken curries (higher than the less affluent and rural Pakistani) and to rural Pakistani in the consumption of vegetable curries (higher than that of affluent or less affluent Pakistanis).

Comparison of foods consumed by the three groups of Pakistani children

The two significant differences noted on week days related to the consumption of chicken curry and vegetable curries. Chicken curry was eaten comparatively more often by the affluent urban Pakistani children (20%) and vegetable curry eaten more often by the rural Pakistani children (31%) in relation to other groups. While these differences were not so marked on week ends, the other ones which were noticeable were the significantly higher consumption of chapati by the rural children (81% RrP, 55% LaP, 61% AfP) and significantly higher consumption of meat 'pulao' and vegetable 'pulao' by the less affluent children in relation to other groups.

Table A13e-ii: Foods Consumed At Evening meal On Week Days According To Group

FOODS	p (UK3)	p (PK4)	GROUPS					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n-46	n-82	n-60	n 88	n=30	n-61
Bread Asian, wholemeal	****	ns	85	87	75	88	0	61
Bread English, white	*	*	0	2	2	10	27	7
Bread English, fried	*	ns	0	0	0	0	7	0
Rice, plain (boiled)	ns	ns	37	26	27	18	7	16
Pasta, plain	**	ns	0	0	2	1	20	5
Cheese	ns	ns	0	0	0	2	7	7
Yoghurt, plain	***	ns	0	4	7	5	0	23
Potato Chips, fried	***	**	0	0	0	9	57	21
Raw or Boiled Vegetables	***	*	0	4	5	13	47	21
Other Potato	***	ns	0	0	0	3	27	15
Crisps	***	ns	0	1	0	0	10	3
Asian Snacks (chat, chevda)	ns	*	0	2	7	0	0	0
Cakes	*	ns	0	0	0	2	10	0
Fruits	ns	ns	0	0	0	1	7	0
Fruits	ns	ns	4	5	10	13	3	8
Fruit Juice	ns	**	0	0	0	9	7	13
Fruit Drink	**	**	0	0	0	9	33	11
Fizzy Drink	ns	*	0	2	2	9	13	11
Milk Whole (as drink)	ns	ns	2	4	7	3	0	7
Milk Skimmed (as drink)	ns	ns	0	0	0	2	7	3
Sandwich, meat or egg	ns	ns	0	1	0	3	13	8
Sandwich, jam	**	ns	0	0	2	0	10	0
Meat Pies	****	ns	0	0	0	0	23	5
Baked Cheese and Veg. Savoury (pizza)	ns	*	0	0	0	6	10	8
Meat/Cheese Pasta	ns	ns	0	0	0	1	7	2
Vegetable Pulao	ns	*	9	11	13	1	0	2
English Ckd. Veg. (baked beans)	ns	ns	0	0	0	3	17	10
Curry, Meat	ns	ns	7	20	23	26	10	13
Curry, Chicken	**	*	7	9	23	19	0	3
Curry, Meat and Veg	ns	****	28	34	25	6	3	0
Curry, peas, beans or lentils	ns	****	61	50	40	15	0	15
Curry, vegetable	**	**	52	34	20	47	10	49
Kebab, Meat	ns	ns	0	2	5	2	3	2
Boiled or Grilled Meat	****	ns	0	0	0	0	17	0
Fried Meat	*	ns	0	0	0	0	7	0
Fried Fish	ns	**	0	0	0	9	13	8
Fried Chicken	*	ns	0	0	0	1	13	7
Meat Sausage	****	ns	0	0	0	0	33	3
Pudding, Ice Cream	ns	ns	0	2	5	8	13	10
Dessert, Asian	ns	ns	2	1	8	3	7	2
Tomato Sauce	ns	ns	0	0	0	2	10	2
Chutney	ns	ns	0	5	3	0	0	0
Egg, fried or scrambled	ns	ns	7	5	5	7	10	3

*=P< 05, **=P< 005, ***=P< 0005, ****=P< 00005

Table A13e-iii: Foods Consumed At Evening meal On Week End Days According To Group

FOODS	sign.UK	p (PK4)	GROUPS					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n 36	n 66	n=49	n=63	n=19	n=48
Bread Asian, white	ns	ns	0	0	0	5	0	6
Bread Asian, wholemeal	***	ns	81	55	61	56	0	42
Bread Asian, fried	ns	ns	6	0	2	0	0	2
Bread English, white	ns	ns	0	0	2	5	16	4
Rice, plain (boiled)	ns	ns	11	11	14	11	5	15
Yoghurt, plain	ns	ns	3	6	6	6	0	13
Gravy	ns	ns	0	0	0	0	0	0
Potato Chips, fried	ns	*	0	0	0	6	21	15
Raw or Boiled Vegetables	ns	**	0	3	0	14	32	15
Other Potato (jacket, mashed)	**	ns	0	0	0	2	21	2
Crisps	ns	ns	0	0	0	0	5	0
Sweets (candies)	ns	ns	0	0	0	0	5	0
Cakes	ns	ns	0	2	2	0	5	4
Fruits	ns	ns	0	3	0	5	0	8
Tea or Coffee	**	ns	3	0	6	0	11	0
Fruit Juice	ns	*	0	0	0	6	11	15
Fruit Drink	ns	ns	0	0	0	3	5	6
Fizzy Drink	ns	ns	3	2	6	10	16	17
Milk Whole (as drink)	ns	ns	6	5	0	5	0	0
Sandwich, meat or egg	**	ns	0	0	4	3	32	8
Sandwich, butter or margarine	ns	ns	0	0	0	2	5	0
Sandwich, jam	**	ns	0	0	0	0	11	0
Meat Pies	ns	ns	0	0	0	0	5	2
Baked Cheese and Veg. Savoury	ns	ns	0	0	0	3	5	4
Meat/Cheese Pasta	ns	ns	0	0	0	0	5	2
Meat Pulao	ns	**	0	15	2	2	0	0
Vegetable Pulao	ns	***	3	18	4	0	0	2
English Ckd. Veg. (bkd beans)	ns	ns	0	0	0	5	11	6
Curry, Meat	**	ns	3	15	14	22	5	2
Curry, Chicken	ns	ns	6	9	20	8	0	10
Curry, Meat and Veg.	ns	ns	17	11	8	3	0	0
Curry, peas, beans or lentils	ns	ns	25	11	20	10	0	10
Curry, vegetable	*	ns	31	14	16	24	0	33
Kebab, Meat	ns	ns	3	5	4	5	5	0
Boiled or Grilled Chicken	ns	ns	0	0	0	0	5	0
Fried Meat	ns	ns	0	0	2	0	5	2
Fried Fish	ns	*	0	0	0	6	0	6
Fried Chicken	ns	ns	0	0	0	2	11	2
Meat Sausage	**	ns	0	0	0	0	11	0
Pudding, Ice Cream	ns	ns	0	0	0	5	16	8
Dessert, Asian	ns	ns	6	5	0	0	0	0
Tomato Sauce	ns	ns	0	0	0	0	5	0
Chutney	ns	ns	3	3	6	0	5	0
Egg, fried or scrambled	ns	ns	8	0	4	3	0	4

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 13f: Evening Snacks

In the UK British Caucasian children had food at this time significantly more often (60%WD & 33%WE) than British Pakistani (28%WD & 14%WE) or British Indian (46%WD & 38%WE) children both on week days and on week end days. British Indian children ate something at this time significantly more often than British Pakistani children both on week days and week ends. Among the Pakistani groups the difference between the two urban groups was not marked, while rural children ate something a this time less often (21% WD and 8%WE) than did affluent (38% WD and 25%WE) or less affluent urban (34% WD and 25%WE) Pakistani children.

Evening Snacks were mostly taken at home by all of the six groups of children. The frequency of having food at this time at others home was higher for week ends than for week days for the British Caucasian, British Indian and Affluent urban Pakistanis.

British Caucasian and British Indian had this snack more often with their parents on week days than they did at week ends. For the British Pakistani children the reverse was true. British children never had it with siblings only or with relatives while both the British Asian groups occasionally had these snacks with relatives or siblings.

Table A13f-i: Where And With Whom Children Ate Their Evening Snacks On Weekdays And Weekends According To Group

	GROUP											
	RrP	RrP	LAP	LAP	AfP	AfP	BrP	BrP	BrC	BrC	BrI	BrI
	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
	%	%	%	%	%	%	%	%	%	%	%	%
	n=46	*n=40*	*n=83*	*n=71*	*n=60*	*n=56*	*n=90*	*n=70*	*n=30*	*n=24*	*n=65*	*n=52*
WHERE EATEN												
Home	100	100	100	83	97	80	97	100	89	88	94	81
Other Home	0	0	0	0	0	20	3	0	4	13	4	14
Outside	0	0	0	17	3	0	0	0	4	0	2	5
WITH WHOM EATEN												
Alone	25	67	26	33	39	27	23	18	18	38	24	43
Parents	63	0	59	44	35	27	46	73	71	50	64	38
Siblings	13	33	10	22	26	20	29	9	0	0	8	10
Friends	0	0	0	0	0	0	0	0	11	13	2	5
Relatives	0	0	5	0	0	7	3	0	0	0	2	5

Comparison of foods consumed by the three groups of British children

During the evening British Caucasian children had tea, coffee or fizzy drinks significantly more frequently than British Pakistani or British Indian children. Whereas both British Indian and the British Pakistani children ate fruits much more frequently than did the British Caucasian children.

Comparison of the food consumed by the British Pakistani and Pakistani children

When British Pakistani children ate anything during the evening it was mostly milk (31%, including both whole or skimmed) or fruit (23%). The tendency to drink milk at night was present to varying degrees among the three groups of Pakistani children also. But the main difference between the British Pakistani and Pakistani children was the kind of milk being consumed. The consumption of whole milk was lower and that of skimmed milk higher among the British Pakistani as compared to Pakistani children. In fact when children in Pakistan consume milk it is always whole milk because skimmed milk is not commonly available. So intake of skimmed milk by British Pakistani children probably indicates making use of available healthier choices.

British Pakistani children had a lower consumption of fruit, tea/coffee than the rural Pakistani children and a lower consumption of puddings/ice-creams as compared to affluent and less affluent urban Pakistani children. British Pakistani children had a higher consumption of biscuits and sweets than all the Pakistani groups, though this was not significant.

Comparison of foods consumed by the three groups of Pakistani children

Of those children who ate something at night, a comparatively higher proportion of rural Pakistani children ate fruit, nuts and drank tea; whereas children from the urban mostly ate ice cream and drank milk. Both of these trends were statistically significant.

Table A13f-ii: Foods Consumed At Evening Snacks On Week Days According To Group

Foods	p (UK3)	p (PK4)	Groups					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n 10	n 29	n 23	n-26	n=18	n=30
Crisps	ns	ns	0	0	4	8	28	10
Asian Snacks (chat, chevda)	ns	ns	10	3	0	0	6	0
Sweets (candies)	ns	ns	10	7	9	12	17	10
Chocolates	ns	ns	0	0	0	8	17	20
Biscuits	ns	ns	0	7	9	12	22	7
Cakes	ns	ns	10	0	9	8	17	13
Fruits	ns	*	50	14	4	23	6	27
Nuts	ns	ns	0	0	0	4	6	0
Tea or Coffee	*	*	40	17	4	4	28	3
Fruit Juice	ns	ns	0	0	0	8	11	13
Fruit Drink	ns	ns	0	0	4	0	11	10
Fizzy Drink	*	ns	0	14	17	4	33	23
Milk Whole (as drink)	ns	ns	20	38	30	12	17	27
Milk Skimmed (as drink)	ns	*	0	0	0	19	6	3
Pudding, Ice Cream	ns	**	0	17	39	0	0	0
Dessert, Asian	ns	ns	10	7	0	0	0	0

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Table A13f-iii: Foods Consumed At Evening Snacks On Week End Days According To Group

Foods	p (UK3)	p (PK4)	Groups					
			RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n-3	n-17	n=14	n=10	n 8	n=20
Crisps	ns	ns	0	0	0	0	25	5
Asian Snacks (chat, chevda)	ns	ns	33	6	0	20	0	5
Asian Snacks, (pakora, samosa)	ns	ns	0	0	14	0	0	0
Sweets (candies)	ns	ns	0	6	0	0	0	5
Chocolates	ns	ns	0	0	0	10	0	0
Biscuits	ns	ns	0	0	21	0	13	5
Cakes	ns	ns	0	0	0	0	0	15
Fruits	*	**	0	6	0	50	0	15
Nuts	ns	**	33	0	0	0	0	5
Tea or Coffee	ns	ns	33	6	7	0	25	15
Fruit Juice	ns	ns	0	6	0	10	13	0
Fruit Drink	ns	ns	0	0	0	0	25	10
Fizzy Drink	ns	ns	0	0	14	0	13	20
Milk Whole (as drink)	ns	ns	0	47	36	10	0	25
Milk Skimmed (as drink)	ns	ns	0	0	0	10	0	0
Pudding, Ice Cream	ns	ns	0	24	29	0	0	0
Dessert, Asian	ns	**	33	0	0	0	0	0
Soups	ns	ns	0	6	0	0	0	0

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

For all the six groups, number of foods eaten with siblings were more on week days as compared to week ends. But on week ends there were comparatively more foods which were mostly eaten with siblings than were on week days. No specific pattern was revealed regarding foods mostly consumed with siblings by various groups.

Appendix 14: Frequency of Food Consumption

Information about the frequency of food consumption was available from two sources, from the questionnaire filled by the respondents and the three day food record kept by them. The results from both the sources are presented in tables A14a-A14h. Figures quoted in the text refer to food records unless otherwise indicated.

The information from the two sources is neither the duplication of the same aspects of dietary habits nor is it mutually exclusive. Although the two sources of information are expected to supplement and support each other in giving a more clear picture of differences in children's food intake, they were not anticipated to give identical results. In the questionnaire a list of food items was given and children were asked to indicate how often they ate any of those foods or things made from them. (Four possible options to be selected were, *rarely or never*, *less than once a week*, *at least once a week* and *on most days*.) On the other hand food records provided information about foods they had actually eaten.

However in most cases the pattern of differences between groups depicted by the two sources of information was similar. In the text reference to questionnaires' responses is made only where there was a disagreement between them or where information was not available from food records.

Appendix 14a: Meat, Fish & Eggs

Comparison of the three Groups of British Children

Both the groups of South Asian children reported less frequent consumption of grilled or fried meat and than the Caucasian children. However consumption of meat curry was reported significantly more frequently by British Pakistani children (48%) as compared to British Caucasian (17%) or British Indian (18%) children. It is interesting that many British Caucasian chicken also ate meat curry. In the case of chicken British Caucasian children ate fried children more frequently while British Pakistani and British Indian children ate chicken in the form of chicken curry. When all forms of chicken were combined 37% of British Pakistani, 33% of British Caucasian and 22% of British Indian children ate chicken at least once in three record keeping days. Overall fish consumption was also highest among BrP (59%), as compared to BrC (30%) and BrI (35%). But unlike chicken, fish was mostly eaten fried and not in the form of curry by the British Pakistani and British Indian children. The kind of fish eaten by South Asian children was most likely to be cod as the major source was school meals where cod fingers or fillet was served (personal observation). Questionnaire responses also indicated that consumption of oily fish was low while that of other fish was high among South Asians particularly British Pakistanis. These figures indicate that overall consumption of both fish and chicken was highest among British Pakistani children. On the other hand consumption of red meat was reported most frequently by British Caucasian children. Seventy seven percent of British Caucasian, 51% of British Pakistani and 38% of British Indian children reported eating any kind of red meat in three days. British Pakistani and British Indian children reported higher consumption of eggs (32% each) than the Caucasian children.

Comparison of British Pakistani and Pakistani Children

British Pakistani children reported eating red meat foods less frequently than the Pakistani children. The difference lies not only in total frequency but also in types of red meat foods consumed. The majority of Pakistani families in the UK refrain from eating non halal meat, and as commercial red meat products made from halal meat are not widely available the main source of red meat in the diets of UK Pakistani children is home cooked meals that is usually meat curries and occasionally kebabs. British

Pakistani children were expected to eat non traditional foods more frequently than Pakistani children in Pakistan, but due to the avoidance of non halal meat, the frequency of consuming a non traditional fast food, meat burgers, was lower among British Pakistani children (3%) as compared to affluent Pakistani children in Pakistan (15-35%). On the other hand British Pakistani children (43%) did not differ much from urban Pakistani children (49-56%) in the consumption of meat curries. This indicates that total consumption of meat by British Pakistani children would have been higher if halal fast foods were easily available.

Another difference in the type of meat dishes eaten was that British Pakistani children ate meat-vegetable curries significantly less frequently than the Pakistani children (12% vs 38-57% respectively). There are two possible reasons for this trend. One likely reason may be a difference in the availability of vegetables. Some of the vegetable like 'kachnar,' 'loki' and 'turai' are either not available or are very expensive in the UK. Another reason for less frequent consumption of meat- vegetable curries is the price of vegetables in comparison to meat. In Pakistan as the price of vegetables is comparatively much lower than that of meat, housewives add vegetables to meat curries not only to add variety, but in many instances to bring down the cost of the food. In the UK due to the comparatively higher prices of fresh vegetables, meat and vegetable curries might not be any less expensive than meat only curries and since in terms of taste and flavour meat-only curries are preferred, these might be sees as a more convenient choice by the mothers of British Pakistani children.

British Pakistani children ate chicken more often than red meat but their frequency of chicken consumption (chicken curry) was still slightly lower (38%) than that of affluent urban Pakistani children (46%) but was significantly higher than either the less affluent urban (25%) or the rural Pakistani children (21%). Most of the chicken consumed by British Pakistani children was in the form of chicken curries indicating a continuation of traditional eating patterns.

British Pakistani children ate fried eggs in general less frequently (28° o) than Pakistani children (41-47%).

British Pakistani children ate fish more frequently (58° o) than the Pakistani children (0-3%). The most likely reason for this is that it does not need to be slaughtered and there is no religious restriction on eating it So it can be chosen at school Mid-day meals, fish and chips shops and frozen or pre cooked from supermarkets On the other hand in

Pakistan fish is eaten much less frequently than meat, so the higher consumption of fish by British Pakistani children seems to be a compensation for lower consumption of red meat.

Comparison of the three Groups of Pakistani Children

Within the Pakistani group consumption of all meat foods was lowest among rural children. But as expected the relative proportion consuming meat-vegetable curries was higher among rural children. Among affluent and less affluent urban children the percentage of children who ate meat-only or meat-vegetable curries was similar, which was 49 and 47 % respectively for affluent and 56 and 54% for less affluent children. Whereas in the rural group 38% of children ate meat-vegetable curries and only 18% ate meat-only curries. Within the urban group less affluent children had slightly higher consumption of meat curries and significantly lower consumption of chicken curries (46% AfP vs 25% LaP). Consumption of fried eggs (41-47%) was very similar in all the three Pakistani groups.

Table A14a: Frequency Of Consuming Meat, Milk And Eggs According To Group

Percentage Of Children Who Consumed These Foods (Meat And Eggs) At Least Once in Three days (*Information From Food Records*)								
FOOD ITEMS	p (UK3)	P (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=40	n=69	n=52	n=70	n=24	n=50
Eggs	ns	ns	41	47	41	32	23	32
Meat, Grilled	ns	ns	0	0	2	0	27	12
Meat, Fried	****	ns	13	10	20	9	53	17
Meat Curry	**	**	18	56	49	48	17	18
Curry, Meat and Veg.	ns	****	38	54	47	12	0	1
Chicken, Grilled	ns	ns	0	0	0	1	7	3
Chicken Curry	****	*	21	25	46	33	0	12
Chicken, Fried	**	ns	0	0	2	3	30	11
Fish, Grilled	ns	*	0	0	0	6	7	1
Fish, Fried	**	****	3	0	0	56	23	34
Percentage Of Children Who Consumed These Foods (From Meat And Eggs Group) At Least Once A Week (*Information From Questionnaires*)								
	p (UK3)	P (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			n 92	n=142	n 150	n=115	n=37	n=70
Lamb, Beef, Pork Etc.	****	****	39	58	60	15	48	25
Poultry (Chicken Etc)	ns	****	53	43	57	38	47	49
Meat Pasties	*	na	-	-	-	22	41	29
Meat Burger	****	ns	15	24	35	3	50	35
Oily Fish	ns	na	-	-	-	23	9	17
Other Fish	**	****	36	32	30	65	39	45
Eggs	*	**	55	66	76	59	48	38

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 14b: Milk & Milk Products

Comparison of the three Groups of British Children

The overall frequency of milk consumption was very similar for all the three groups of children. 79% BrP, 80% BrC and 83% BrI reported consuming milk (as a drink or with cereals) at least once in three days. However the type of milk preferred was not the same. Both the South Asian groups had more frequent consumption of whole milk (66% BrP & 3% BrI vs 53% BrC) and less frequent consumption of skimmed milk (22% BrP, & 26% BrI vs 37% BrC) as compared to British Caucasian children.

A slightly higher percentage of British Pakistani children (18%) and significantly higher percentage of British Indian children (34%) reported eating plain yoghurt at least once in three days as compared to British Caucasian children (13%). In contrast the consumption of fruit yoghurt was higher among British Caucasian children (10%) as compared to British Pakistani (3%) or British Indian (0%) children. From the questionnaire responses where the type of yoghurt was unspecified the difference in consumption was less pronounced and not statistically significant.

Higher consumption of low fat milk by the Caucasian children seems to be offset by more frequent consumption of cheese as indicated by questionnaire responses. According to food records consumption of cheese (as an accompaniment to other foods) was higher among British Caucasian (17%) and British Indian children (18%) as compared to British Pakistani children (9%). In the questionnaires where cheese consumption included consumption in mixed/cooked dishes as well, children's responses indicated a higher consumption of full fat cheeses by British Caucasian children (56%) as compared to British Indian (49%) and British Pakistani (32%) children.

Comparison of British Pakistani and Pakistani Children.

According to the food records British Pakistani children consumed whole milk (66%) more often than rural (33%) and less affluent (53°o) Pakistani children. Twenty two percent of British Pakistani and none of the children in Pakistan consumed skimmed milk during the three record keeping days The questionnaire responses indicate a similar frequency of skimmed milk consumption by the British Pakistani and children in

Pakistan which at first may seem strange since skimmed milk is not commonly available in Pakistan.

However a few words about milk consumption in Pakistan may clarify this. In Pakistan milk typically used in both urban and rural areas comes from buffaloes and has at least 7% fat. It is supplied unprocessed and in order to prevent spoilage, it is boiled soon after delivery. As it is not homogenised and is high in fats, on cooling a layer of fats and casein is formed on the surface of the milk which is called 'balai' meaning top layer. Generally milk which is high in fats and forms a thick layer of 'balai' is considered to be pure and of good quality. However consuming milk with or without this layer is a matter of personal preference. Some adults and children do not like to have any hint of 'balai' in their tea or milk while some others would like to have an extra helping. As skimmed milk is not available in Pakistan, when Pakistani children mention skimmed or semi-skimmed milk what they mean is the milk from which 'balai' is removed.

Frequency of eating yoghurt among British Pakistani children did not differ significantly from the frequency among children in Pakistan. The consumption of plain yoghurt was slightly but not significantly lower among British Pakistani children, but was offset by the higher consumption of fruit yoghurt. As fruit yoghurts are not generally available in Pakistan, none of the Pakistani children consumed them.

Consumption of cheese was significantly higher among British Pakistani children (9% of British Pakistani and none of Pakistani children consumed it) and this is apparently an assimilation of British eating habits. British Pakistani children are probably eating it as an alternative to non halal meat dishes at school meals and when eating out.

Comparison of the three Groups of Pakistani Children

Consumption of milk seems to be inversely associated with socio-economic status. 66% of AfP, 53% of LaP and 33% of RrP consumed milk at least once in three record keeping days. Consumption of yoghurt was similar in all the three groups of children in Pakistan (26-29%).

Table A14b: Frequency Of Food Consumption: Milk And Products According To Group

Percentage Of Children Who Consumed These Foods (Milk) At Least Once in Three days (*Information From Food Records*)								
FOOD ITEMS	p (UK3)	P (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=40	n-69	n-52	n=70	n-24	n=50
Yoghurt	*	ns	26	29	27	18	13	34
Cheese	ns	****	0	0	0	9	17	18
Skimmed Milk	ns	****	0	0	0	22	37	26
Whole Milk	ns	****	33	53	66	66	53	63
Percentage Of Children Who Consumed These Foods (From Milk Group) At Least Once A Week (*Information From Questionnaires*)								
	p (UK3)	P (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			n-92	n-142	n 150	n=115	n=37	n-70
Milk, Full Fat	ns	*	76	74	78	61	47	61
Semi Or Skimmed Milk	ns	ns	41	36	48	49	68	53
Yoghurt	ns	ns	68	55	61	59	47	58
Low Fat Cheese	ns	na	-	-	-	28	21	26
Other Cheese	ns	*	7	13	19	32	56	49

*=P<.05, **=P<.005, ***=P<.0005, ****=P< 00005

Appendix 14c: Fruits And Vegetables

Comparison of the three Groups of British Children

Excluding baked beans and salads South Asian children reported more frequent consumption of all other forms of vegetables. Consumption of lentils was significantly (p=.004) more frequent among both groups of South Asian children. Frequency of fruit consumption was higher among British Pakistani (57%) and British Indian children (52%) as compared to British Caucasian children (43%).

Overall, Caucasian children were eating more potatoes. An unexpected observation in this regard is the indication of a higher frequency of chip consumption in the questionnaire responses by Pakistani children. One of the reason for this may be mis-interpretation of the food name by Pakistani children because in Pakistan chips indicates crisps and French fries denotes chips as understood in the UK. So possibly due to a language British Pakistani children may be using the name interchangeably and included both when responding to this query.

Consumption of Asian snacks was very low even among South Asian children and so there was no significant difference among the three groups of British children in this regard.

Comparison of British Pakistani and Pakistani Children

When Pakistani children eat potatoes it is mostly in the form of an additional ingredient in curries and bhajis and rarely forms a separate item of the meal as may be true in the case of British children. In these analysis potato dishes were not categorised as a separate group and the dishes were grouped according to the main ingredient for example chickpeas and potato curry was grouped into lentils and so on. So overall consumption of potatoes by Pakistani children is probably underestimated. But keeping in mind the significantly higher consumption of chips and crisps by the British Pakistani children, it may safely be assumed that British Pakistani children eat potatoes more frequently than their Pakistani counterparts.

From the questionnaire responses it appears that British Pakistani children eat more peas, beans and lentils than the Pakistani children, but in fact this is true of baked beans only which are consumed almost daily by most of the British Pakistani children at their school Mid-day meal. Consumption of lentils in the traditional style of 'dals' is in fact much lower among the British Pakistani children.

As is indicated by questionnaire responses the overall consumption of vegetables by British Pakistani children seemed to be higher than among the urban Pakistani children and it is almost at the same level as that of rural Pakistani children. This may be in part related to availability of halal meat but it may also indicate continuing rural eating habits, the type of population parents or grand parents of British Pakistani children originally came from.

Consumption of fresh fruit and vegetables seemed to increase with the increased affluence of Pakistani groups. This trend is indicated by higher consumption of fruits by affluent urban children (47%) followed by the less affluent (42%) and rural children (31%). The British Pakistani children were in most cases more like affluent urban children rather than the rural ones.

Although the difference was not statistically significant, British Pakistani children had slightly lower consumption of pizza than the other two groups of British children.

The traditional Asian vegetarian snacks, (chevda, chat, pakora, samosa etc.) were eaten significantly more frequently by Pakistani children as compared to British Pakistani children whereas western style vegetarian snacks like pizza and vegetable pasties were consumed more frequently by the British Pakistani children. Considering that western style vegetarian snacks are much more easily available in UK than they are in Pakistan and that there is no religious restriction in eating them, higher consumption of these snacks among British Pakistani children as compared to Pakistani in Pakistan is not unexpected.

Comparison of the three Groups of Pakistani Children

Consumption of lentils and vegetable curries was highest among rural children (95% & 90% respectively) and lowest in affluent urban children (69% & 41% respectively). Consumption of salads was higher in affluent urban group (47%) and lowest in rural group (31%).

Overall, consumption of traditional, vegetarian snacks (chevda, chat, pakora and samosas) was not significantly different between the three groups.

Frequency of Consuming Fruit and Vegetables and Vegetarian Snacks According To Group

Percentage Of Children Who Consumed These Foods (From Fruit and Vegetable Group) At Least Once in Three days (*Information From Food Records*)								
FOOD ITEMS	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=40	n=69	n=52	n=70	n=24	n=50
Chips	*	****	0	4	2	71	97	66
Crisps	ns	****	0	24	32	74	80	71
Lentils	**	****	95	75	69	26	0	26
Vegetables	ns	****	90	71	41	90	90	91
Raw or Boiled Vegetables	*	**	5	17	19	34	68	33
Fruit	ns	*	31	42	47	57	43	52
Pizza	ns	****	0	0	2	26	30	29
Asian Snacks (chat, chevda)	na	****	23	36	29	1	0	1
Asian Snacks, (pakora, samosa)	na	**	13	10	34	13	3	12
Nuts	ns	ns	3	0	3	6	3	5
Percentage Of Children Who Consumed These Foods (From Fruit and Vegetable Group) At Least Once A Week (*Information From Questionnaires*)								
Boiled Or Mashed Potatoes	ns	****	38	28	37	54	74	45
Jacket Potatoes	ns	ns	27	28	24	39	34	39
Chips	ns	****	34	33	29	78	68	63
Crisps	ns	****	37	50	61	87	85	82
Vegetable Pasties	ns	****	6	17	21	55	27	45
Pizza	ns	****	10	24	31	44	52	57
Veg. Burger	ns	*	16	17	23	87	3	33
Vegetable Samosa	ns	na	18	17	19	-	-	-
DAL Burger	ns	na	13	24	24	-	-	-
Baked Beans	ns	na	-	-	-	68	71	69
Peas, Beans Or Lentils	*	****	24	24	23	65	41	67
Nuts	ns	****	32	39	53	38	28	37
Vegetables	ns	*	85	65	74	81	78	82
Salads	*	**	42	54	67	53	66	38
Fresh Fruits	ns	*	66	68	81	89	79	81

*=P< 05, **=P< 005, ***=P< 0005, ****=P< 00005

Appendix 14d: Breads And Cereals

Comparison of the three Groups of British Children

The overall frequency of bread consumption was similar for all the three groups as all of them reported eating any form of bread at least once in three days, but there were differences in the type and form in which bread was consumed. Asian children were consuming chapati almost every day that is made from whole wheat and consequently had significantly ($p=0.0000$) higher consumption (97% BrP & 78% BrI) of whole wheat breads (sliced brown bread and chapati grouped together) than the British Caucasian children (3%).

Although the consumption of sandwiches (includes burger in a bun) was significantly higher for Caucasian children consumption of white bread other than as sandwiches was higher for South Asians. This difference was due to the pattern of eating bread with tea or milk at breakfast and with curries (in place of chapati) at other meals. In sandwiches the difference was not only in frequency of sandwich consumption as a whole but also in the type of sandwiches consumed. Caucasian children reported significantly more frequent consumption of meat sandwiches than the South Asians while the situation was reversed in case of vegetable sandwiches. (table 4-29)

In the case of breakfast cereals information from diaries and questionnaires did not coincide with each other. The percentage of children who indicated in their questionnaire that they eat sugared cereals 'at least once a week' was much higher than the percentage who actually ate these type of cereals at least once according to their records. This discrepancy was not proportionate for the three ethnic groups, being smallest for British Caucasian and greatest for British Pakistani children However there was good agreement concerning the finding that Pakistani children had a significantly higher consumption of plain breakfast cereals

Table A14c : Frequency of Consuming Breads and Cereals According To Group

Percentage Of Children Who Consumed These Foods (From Bread and Cereals Group) At Least Once in Three days (*Information From Food Records*)								
FOOD ITEMS	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=40	n=69	n=52	n=70	n=24	n=50
Whole Wheat Bread	****	****	100	99	98	97	3	78
White Bread	ns	****	13	51	54	61	47	69
Sandwich Meat	**	****	0	6	39	33	77	62
Sandwich Veg	*	****	0	0	3	16	0	9
Sandwiches Other	ns	****	0	1	10	31	43	38
Bread Asian, fried	ns	****	82	61	44	0	0	0
Pasta	**	ns	0	0	0	6	27	17
Rice	*	ns	64	49	46	40	13	31
Meat Pulao	ns	****	5	26	12	4	0	0
Vegetable Pulao	ns	****	33	38	29	3	0	3
Sugared Breakfast Cereals	ns	****	0	0	0	17	30	28
High Fibre Breakfast Cereals	ns	****	0	1	0	14	23	20
Plain Breakfast Cereals	**	****	0	3	3	61	37	34
Percentage Of Children Who Consumed These Foods (Breads and Cereals) At Least Once A Week (*Information From Questionnaires*)								
High Fibre White Bread	ns	na	-	-	-	38	47	34
Ordinary White Bread	ns	****	34	51	73	76	82	69
Whole Meal Bread	ns	****	14	17	25	48	29	38
Chapatti	****	ns	98	89	88	99	1	78
White Chapati	ns	ns	36	34	43	-	-	-
Nan	ns	na	59	53	65	-	-	-
Paratha	ns	na	86	59	62	-	-	-
Puri	ns	ns	28	36	36	-	-	-
Pasta	ns	****	42	32	36	76	64	63
Rice	ns	****	74	60	73	84	52	60
Maize Flour	ns	****	45	30	24	18	2	13
Sugar Coated Cereals	ns	****	5	9	14	53	48	59
High Fibre Cereals	ns	****	22	12	14	29	16	21
Other Cereals	ns	****	6	7	19	68	72	65

*=P< 05, **=P< 005, ***=P< 0005, ****=P< 00005

Comparison of British Pakistani and Pakistani Children

British Pakistani children ate all types of English bread more often than the Pakistani children.

British Pakistani and affluent urban Pakistani had a similar frequency of consumption of meat sandwiches and jam sandwiches whereas the consumption of all the other types of sandwiches was significantly higher among the British Pakistani children as compared to Pakistani children.

Although the frequency of consumption of plain chapati (Asian brown bread) was similar the consumption of fried Asian breads, Paratha and Puri were significantly lower among the British Pakistani children as compared to any group of the Pakistani children. It seems that parathas that are usually eaten at breakfast are replaced by English breads and breakfast cereals in British Pakistani children.

British Pakistani children had a similar frequency of plain boiled rice consumption as that of the Pakistani children but the frequency of consuming other rice dishes like 'pulao' was significantly lower among British Pakistani children. As rice is considered to be more suitable for the mid-day meal rather than evening meal by many Pakistani families and for warm rather than cold weather, the lower frequency of its consumption by British Pakistani children seems plausible (because of children's eating mid-day meal at school and because of the weather). As pulao and biryani etc. are inevitably included in party evening meals and are also eaten out in Pakistan, one of the reasons for lower consumption by British Pakistani children might be getting fewer opportunities to attend family feasts and wedding parties and consequently have less chance to eat these foods The consumption of these foods may also be low because of the fact that these items are not commonly available in restaurants and take-aways and British Pakistani children may be eating other foods instead.

British Pakistani children had higher consumption of pasta than the Pakistani children and when Pakistani children indicate consumption of pasta it is usually not typical Italian pasta but sweet or savoury 'sevian', which is prepared from the same ingredients as pasta but is cooked and eaten differently and is a considered to be a traditional rather than modern food.

Higher consumption of breakfast cereals by British Pakistani children is undoubtedly an uptake of British food habits. In Pakistan there is very little variety of breakfast cereals available and to most of the middle or upper middle class local people it is an expensive foreign food that they may eat occasionally but not regularly. The high level of consumption indicated by questionnaire responses is most probably due to interpretation of the terms.

Comparison of the three Groups of Pakistani Children

Almost all (98-100%) the Pakistani children ate chapati at least once in the three record keeping days. Rural Pakistani children ate fried Asian breads more often and English white bread less often than urban children. Within the urban group English white bread was consumed with similar frequency but fried Asian bread was consumed less frequently by affluent Pakistani children. It seems that consumption of fried Asian breads, which are mostly eaten at breakfast, decreases with increasing socio-economic level, probably because of the convenience of buying sliced bread.

Appendix 14e: Biscuits, cakes & desserts

Comparison of British Pakistani and Pakistani Children

In the questionnaires, where biscuits and cakes were grouped together children's responses indicate higher consumption of foods from this group by the British Pakistani children. Information from food records showed that the difference lay mainly in the consumption of cakes and not biscuits. The proportion of British Pakistani children who consumed biscuits was similar (42%) to affluent Pakistani children (42%) and slightly higher than less affluent Pakistani (36%) and rural Pakistani children (33%). Cakes were consumed by 62% of British Pakistani, 22% of affluent Pakistani, and about 5% each of less affluent and rural Pakistani children. The difference in frequency of cake consumption was highly significant (p=0.0000). The higher consumption of cakes by the British Pakistani children was mainly due to eating cakes at school meals (see 4.2.4).

It is apparent from food records that British Pakistani children ate asian desserts significantly less frequently (4%) than any of the groups in Pakistan (41-44%). On the other hand puddings and ice cream consumption among British Pakistani children was higher (19%) that among rural Pakistani children (5%), and significantly (p=0.0003) lower than that among affluent (44%) and less affluent (38%) urban Pakistani children.

Comparison of the three Groups of British Children

Although British Pakistani and British Indian children had slightly lower consumption of biscuits, cakes and puddings the difference was not statistically significant. Reported frequency of consuming pies was however significantly lower (p=0.00001) among British Pakistani (0%) and British Indian children (8%) as compared to British Caucasian children (40%).

Comparison of the three Groups of Pakistani Children

Less-affluent and rural Pakistani children consumed biscuits (non significant) and cakes (p=0.0000) much less frequently than affluent Pakistani children.

Table 4-29: Frequency of Consuming Biscuits, Cakes and Desserts According To Group

Percentage Of Children Who Consumed These Foods (Biscuits, cakes & Desserts) At Least Once In Three Days *(Information From Food Records)*								
Food Items	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=40	n=69	n=52	n=70	n=24	n=50
Dessert, Asian (mithai etc.)	ns	****	41	47	42	5	1	4
Biscuits	ns	ns	33	36	41	40	60	35
Cakes	ns	****	5	4	22	57	60	51
Puddings, Ice creams	ns	****	5	38	44	21	27	25
Pies	****	ns	0	0	0	0	40	7.7
Percentage Of Children Who Consumed These Foods (Biscuits, Cakes & Desserts) At Least Once A Week *(Information From Questionnaires)*								
Biscuits, Cakes	ns	****	69	53	62	75	79	74
Asian Sweets	**	****	52	38	36	53	7	47
Ice Cream	ns	****	47	50	69	74	62	64
Halwa	na	na	55	41	37	-	-	-

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 14f: Sweets and Chocolates

Comparison of the three Groups of British Children

British Caucasian children showed slightly more frequent consumption of both sweets and chocolates (non significant) than British Indian and British Pakistani children. Although not apparent from food records, questionnaire responses indicated frequent consumption of Asian sweets (mithai) among both the South Asians groups. 53% of British Pakistani, 47% of British Indian, and 7% of British Caucasian reported consuming children mithai at least once a week.

Comparison of British Pakistani and Pakistani Children

British Pakistani children ate both sweets and chocolates significantly more often than all the Pakistani children. The difference was much more pronounced in the case of chocolates (50% BrP vs 12% AfP, 3% LaP & 0% RrP) than in the case of sweets (54% BrP vs 37% AfP, 33% LaP, & 23% RrP). Chocolates are not commonly available in Pakistan and are quite expensive as compared to sweets. So it is not unexpected that its consumption was very low among the Pakistani children.

Comparison of the three Groups of Pakistani Children

Consumption of both sweets and chocolates was higher at the affluent urban level (37 and 12 %) and lowest at the rural level (23 & 0 %).

Table A14f: Frequency Of Consuming Sweets According To Group

Percentage Of Children Who Consumed These Foods (Sweets and chocolates) At Least Once in Three days (*Information From Food Records*)								
FOOD ITEMS	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n=40	n=69	n 52	n=70	n 24	n=50
Chocolates	ns	****	0	3	12	50	57	51
Sweets	ns	*	23	33	37	51	63	43
Percentage Of Children Who Consumed These Foods (Sweets and chocolates) At Least Once A Week (*Information From Questionnaires*)								
Sweets, Chocolates, Choc Bars	ns	****	36	41	57	86	91	82

Appendix 14g: Hot and Cold Drinks

Comparison of the three Groups of British Children

Indian children had the highest (63%) and Pakistani the lowest (47%) consumption of fizzy drinks. This difference however was not statistically significant.

British Indian (98%) and Pakistani children (86%) had significantly higher consumption of fruit juices as compared to British Caucasian children (77%). This tendency was apparent but not significant from the questionnaires.

Food records indicated higher (ns) consumption of tea by the Asians. On the other hand questionnaires showed higher frequency of adding sugar to hot drinks by the Caucasian children.

Comparison of British Pakistani and Pakistani Children

Among the children in Pakistan consumption of tea increased with the decreasing socio-economic status. British Pakistani children had a frequency of tea consumption lower than the less affluent but higher than the affluent Pakistani children.

British Pakistani children had significantly higher consumption of fruit drinks and juices and fizzy drinks than the children in Pakistan.

Comparison of the three Groups of Pakistani Children

Consumption of all the cold drinks was lowest (0-13%) and that of tea was highest (95%), among rural Pakistani children. Within the urban group less affluent children consumed tea (75%) and fruit juice (14%) more often and fruit drinks (%) less often than affluent Pakistani children. Frequency of consuming fizzy drinks was similar (35% LaP and 39% AfP) in both the urban groups.

Table A14g:Frequency Of Consuming Beverages According To Group

Percentage Of Children Who Consumed These Foods (Beverages) At Least Once in Three days (*Information From Food Records*)								
FOOD ITEMS	p (UK3)	p (PK4)	RrP	LaP	AfP	BrP	BrC	BrI
			%	%	%	%	%	%
			n 40	n–69	n–52	n–70	n–24	n=50
Fizzy Drinks	ns	**	13	35	39	47	60	63
Fruit Juice /drinks	**	****	8	18	14	86	77	98
Tea	ns	***	95	78	54	69	50	65
Percentage Of Children Who Consumed These Foods (Beverages) At Least Once A Week (*Information From Questionnaires*)								
Fruit Juice	ns	ns	39	50	50	87	82	81
Low Calorie Drink	ns	na	-	-	-	55	33	31
Fizzy Drink	ns	*	53	52	63	69	71	73
Sugar Added To Hot Drinks	ns	ns	69	58	73	57	70	63

*=P<.05, **=P<.005, ***=P<.0005, ****=P<.00005

Appendix 14h: Fats, Spreads And Sauces

Comparison of the three Groups of British Children

Information about cooking and spreading fats was obtained from the questionnaires. As expected a significantly higher proportion of British Indian (20%) and British Pakistani children (27%) reported consuming 'ghee' as compared to British Caucasian children. However it is worth noting that consumption of vegetable oil also, was reported most frequently by British Pakistani children, and none of the fats were consumed significantly less frequently by either British Pakistani or British Indian children as compared to British Caucasian children.

Comparison of British Pakistani and Pakistani Children

British Pakistani children had significantly less frequent (27%) consumption of 'ghee' than all groups of Pakistani children (64-67%) and higher consumption of butter and margarine (62% BrP vs 39% LaP, 42% AfP and 51% RrP). The proportion of children who reported consuming vegetable oil was similar in British Pakistani (68%) and affluent Pakistani children (64%), which was significantly higher than less affluent Pakistani (41%) and rural Pakistani children (35%)

Comparison of the three Groups of Pakistani Children

Frequency of using butter was highest and that of 'ghee' and vegetable oil lowest at the rural level. Consumption of both vegetable oil and 'ghee' was highest among affluent urban children. It should be mentioned here that the term 'ghee' is not used exclusively for clarified butter as it is generally described in western texts (e.g. Smith et al, 1993). Hydrogenated vegetable oils are also called 'ghee' in the Indian subcontinent. If a distinction is required, clarified butter is described as 'desi' (meaning local) or 'asli' (meaning pure) 'ghee'; and hydrogenated oils are called 'banaspati' (meaning foreign) 'ghee'. As pure 'ghee' is much more costly than vegetable 'ghee' it is not commonly used in either urban or rural areas. However on a national basis relative consumption of pure 'ghee' is higher in rural areas (GoP).

Within the last two decades probably due to informal messages from health professionals and in the media, the availability and consumption of vegetable oils has markedly increased in some urban areas of Pakistan (GoP). But hydrogenated oils are used simultaneously in most homes. In general, a shift from using vegetable 'ghee' to vegetable oil is associated with educational level and health consciousness of families (personal observation).

In this study no attempt was made to differentiate between two types of 'ghee'; and keeping in mind the national trend these responses basically relate to vegetable 'ghee' rather than pure 'ghee'.

Appendix 15: Method of calculating exposure score

This ratio was designed to indicate exposure to western / non traditional influences. Each child was assigned a traditional and a non traditional score according to his/her degree of involvement in traditional and western activities and South Asian and English language skills. The western score was divided by the traditional score to get a ratio representing relative involvement in western activities. This was called Western Exposure Score.

For each activity 0-4 points were given according to the frequency of participation. The traditional score was calculated by adding the points for all the traditional activities (Appendix 5, Q.41i, & Q.42-a, b, d, f, g, i,) and South Asian language skills (Appendix 5, Q.50 Urdu, Hindi and Punjabi). Western score was calculated by adding the scores for all the western activities (Appendix 5, Q 42-c, e, h, i & q & 50) and English language skills (Appendix 5, Q.50-English). For language skills one point each was given for the ability to read and write and maximum of two point for ability to speak. For any language those children who mentioned that they could speak the language fluently were given two points, those who could speak but not fluently were given one point and those who could not speak at all were given zero point for their ability to speak any particular language. In this way maximum points for South Asian language skills (Urdu, Hindi and Punjabi) were twelve.

Higher score more indicated more westernised activity pattern (range 0.05-1.09).